The Appraisal of REAL ESTATE

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The Appraisal of Real Estate

SIXTH EDITION

Prepared by the Sixth Edition Textbook Committee

AMERICAN INSTITUTE OF REAL ESTATE APPRAISERS
155 East Superior Street, Chicago, Illinois 60611

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Sixth edition.

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Foreword

THIS is the *Sixth* Edition of *The Appraisal of Real Estate,* the basic textbook published by the American Institute of Real Estate Appraisers. It is the result of the dedicated efforts of many people over many years.

Acknowledgment is made of the valued work over more than a quarter-century of the members of the text committees responsible for the five previous editions, as well as the early M.A.I. thinkers and writers who preceded them.

The Sixth Edition Textbook Committee has spent over two years in research, investigation, writing, rewriting, and editing in order to produce this edition. The actual writing of new material, and the rewriting and organizing the existing material were done by four members of the committee: Walter R. Kuehnle, Richard L. Lodge, Thurston H. Ross, Ph.D., and Herman O. Walther. Other members of the committee, all of whom deserve recognition for their valuable efforts, were: Charles B. Akerson, W. I. Berman, George F. Bloom, Ph.D., L. W. Ellwood, Jack K. Mann and William G. Murray, Ph.D.

In addition to the members of the committee, many other M.A.I.'s made valuable suggestions which contributed to the final result. Particular mention should be made of the contributions of S. Z. Bennett, Robert B. Boblett, James H. Boykin, Ph.D., Berkley W. Duck, Jr., Edward B. Horton, Jr., and George L. Mercer.

Special commendation is accorded to Walter R. Kuehnle, Chairman of the Sixth Edition Textbook Committee and Past President of the Institute, for his tireless, unselfish devotion and leadership in the production of this publication.

The results of this dedication are to be found on the pages which follow, an authoritative, timely, and challenging new edition of our basic text, *The Appraisal of Real Estate.*

Charles F. Seymour
AIREA President—1973

Introduction to the Sixth Edition

This textbook presents fundamental concepts of the value of real estate and its appraisal. Neither time nor new developments have altered the basic principles as set forth in the first edition. Material from the earlier editions has been extensively revised or rewritten, with much new material added, to expand these basic concepts. Although they do not change, their contemporary application varies with such factors as the fluctuating availability and cost of borrowed capital (mortgages), the impact on value of changing government regulations on gross and net income, and the effect of current or anticipated taxes and of tax shelter on the prospective net income of various classes of investors.

Every appraisal is an answer to a specific question or problem. Accordingly, study of this book should be rewarding, not only for the novice, but also for the experienced appraiser in his continuing study of appraisal problems which are increasing in complexity. Owing to contemporary factors, valuations involve greater pragmatism in obtaining currently required solutions. These more complicated applications of appraisal procedures are often expedited through computer techniques. But the computer has the capacity of no more than a miniscule portion of man's brain. The computer's forte is speed. The advantage of method, whether simple or complex, is consistency and convenience. However, neither method nor computer techniques can substitute for reasoning, and the application of sensibility or judgment to fundamental principles presented in this volume.

Since contemporary factors are continually changing, more intricate application of the appraisal process is best presented in specialized books, or current monographs, articles, and special course and seminar material. However, an understanding of the basic concepts of real estate value and its appraisal as set forth in this volume must always be the point of beginning. The presentation of these basic concepts, both through explanation and simple applications, is the intended function of this text.

Walter R. Kuehnle, M.A.I.

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The Appraisal of Real Estate

CHAPTER ONE

Nature and Purposes of Appraisals

THE MARKET VALUE of real property is created, maintained, modified, or destroyed by the interplay of four of the great forces which motivate the activities of human beings. These are social ideals and standards, economic adjustments and changes, political or governmental regulations, and physical or natural forces. These four set the pattern for the variables in real estate market values. Each force is dynamic. Combined, they are the essence of cause and effect, interweaving to become one vast and ever-changing fabric surrounding and influencing every parcel of real estate on earth.

Forces Influencing Real Estate Value

The many-sided character of each of these great forces presents a problem of considerable complexity. Study of the factors encompassed by each makes it clear that they are multitudinous and in a constant state of change.

A partial list of the social forces includes:

1. Population growth and decline
2. Shifts in population density
3. Changes in size of families
4. Geographical distribution of compatible groups
5. Attitudes toward education and social activities
6. Attitudes toward architectural design and utility
7. Other factors emerging from man's social instincts, ideals, and yearnings.

Economic forces, including the resources and efforts of man to achieve his social ideals are made up of such factors as these:

1. Natural resources—their quantity, quality, location, and rate of depletion
2. Commercial and industrial trends
3. Employment trends and wage levels
4. Availability of money and credit
5. Price levels, interest rates, and tax burdens
6. All other factors which have direct or indirect effect upon purchasing power.

Governmental regulations created by political forces include the following:

1. Zoning laws
2. Building codes
3. Police and fire regulations
4. Rent controls, national defense measures, priorities, allocations, special-use permits, and credit controls
5. Government-sponsored housing and guaranteed mortgage loans
6. Monetary policies that affect the free use of real estate, including all forms of taxation.

Physical forces can be created either by nature or by man. They encompass:

1. Climate and topography
2. Soil fertility
3. Mineral resources
4. Community factors such as transportation, schools, churches, parks, recreation areas
5. Flood control and soil conservation
6. Characteristics of soil and subsoil
7. Technological advances affecting land use.

Each of these social, economic, political, and physical forces affects cost, price, and value. The impact of each force—sometimes direct, sometimes indirect—must be considered in estimating the cost, the probable price, or the value of real property. These four forces, with the factors composing them, constitute the basic raw material for making an appraisal of the value. Any decision or action on the market value of real estate is based upon an appraisal, whether or not it is presented formally.

Definition of an Appraisal of Value

An appraisal of value is an estimate. It is an opinion. An appraisal of the value may be interpreted broadly as the answer to a question under specifically stated conditions and circumstances. This estimate of value requires professional expertise, as well as an understanding of the application of certain methods and techniques, as will be developed further in this text. These are also necessary for appraisals of marketability, feasibility, highest and best use, land utilization, and other aspects of the use and value of real estate.

The reliability of an appraisal of the value depends upon the basic competence and integrity of the appraiser, and upon the soundness and skill with which he processes pertinent data.

The resulting opinion of value derived from the appraisal may be informal, transmitted orally; or it may be formal, presented in written form. Usually it is a written statement setting forth an opinion of the value of an adequately described property as of a specified date, supported by the presentation and analysis of relevant data.

When this definition is considered in terms of an individual's formal training and experience, it becomes apparent that everyone at one time or another has a need for an appraisal of the value of real estate. Interest in real property value is not limited to the affluent. Everyone uses real estate and must pay for its use, either by purchase or rent. Any decision concerning this payment involves a decision about value; and an intelligent decision must be based upon some kind of an appraisal. It follows, of course, that the quality of a real estate decision is closely related to the quality of an appraisal. The need for appraisals is universal; and this need can be logically separated into three levels of activity.

First Level of Real Estate Appraisal Activity

The general public comprises the first level of appraisal activity. These are the people who use real estate, who own real estate, and invest in real estate beyond individual residential and business

needs. The individual members of each group must make decisions about asking prices, offers to buy, mortgages, leases, insurance programs, damages, and land development projects. They make decisions about contemplated developments, construction costs, remodeling, rehabilitation, or modernization projects and other actions which involve responsibility and substantial sums of money. When an individual is confronted by any of these problems, he may make his own decision (appraisal), or he may turn to a professional appraiser for assistance. In either case an intelligent decision cannot be made without an appraisal. That appraisal will be no better than the competence and integrity of the one who makes it.

An understanding of the factors which create and influence real estate value is the result of acquired knowledge. Not every individual can be expected to understand many essential appraisal procedures. Too often people rely upon emotions or their own unfounded judgments, and make costly mistakes. For example:

1. A buyer pays more for a property than is justifiable in the market.
2. A seller takes less for a property than it is worth.
3. A landlord signs a lease, the terms of which are detrimental to his interests.
4. A tenant signs a rental contract which his prospective income will not support.
5. An owner undertakes an unsound modernization or rehabilitation project.

Opinions of value—based on sound appraisals—are safeguards against such commitments.

Not everyone on this first level of activity needs to understand and utilize appraisal techniques; but investors should recognize what constitutes an adequate appraisal, sufficient in scope to meet their requirements.

Second Level of Real Estate Appraisal Activity

The second level of real estate activity is comprised of the men and women in the general real estate vocation—salesmen, brokers,

investors, subdividers and builders, property managers, and mortgage lenders, as well as those concerned with tax assessments, right-of-way proceedings, and other governmental functions.

Although these people usually are not professional appraisers, they deal with problems involving real estate value as part of their everyday work. Frequently the general public asks them to express an opinion of real estate value. It is entirely proper that they give their opinions of value up to the limit of their qualifications. However, they must be aware of their limitations and must recognize those situations in which they are not qualified to act. The services of a professional appraiser should be used whenever the problem calls for expert advice.

Third Level of Real Estate Appraisal Activity

The third level of appraisal activity is made up of professional appraisers. The members of this group may devote their time exclusively to real estate appraisal assignments or they may also carry on a practice in other branches of real estate activity. In any case, they should be highly competent in knowledge, skill, and integrity, and identified by a recognized professional designation.

The need for appraisal services on the professional level has long been recognized by banks, trust companies, savings and loan associations, insurance companies, governmental agencies; universities and other institutions having the responsibility of investing endowment and trust funds; public utilities, chain stores, and many other concerns and individuals who make decisions based upon estimates of real estate value. Investors, private companies, and institutions which have real estate problems are increasing their demands for professional appraisals. Governmental agencies are employing greater numbers of professional salaried appraisers and professional fee appraisers.

Purpose of Real Estate Appraisal

The fundamental purpose of an appraisal assignment is to estimate value. The value most commonly sought is market value.

However, there are other types of value, depending on the use for which the client requires the appraisal.

The need for an appraisal of market value may arise from many situations including the following:

1. Transfer of ownership:
   a. To help prospective buyers decide on offering prices
   b. To help prospective sellers determine acceptable selling prices
   c. To establish a basis for exchanges of real property
   d. To establish a basis for reorganization or for merging the ownership of multiple properties
   e. To distribute the assets of an estate
2. Financing and credit:
   a. To arrive at the essential security offered for a proposed mortgage loan
   b. To provide an investor with a sound basis for deciding whether to purchase real estate mortgages, bonds or other types of securities
   c. To establish a basis for a decision regarding the insuring or underwriting of a loan on real property
3. Just compensation in condemnation proceedings:
   a. To estimate value of property as a whole; that is, before the taking
   b. To estimate value after the taking
   c. To allocate values between the part taken and damage to the remainder
4. A basis for taxation:
   a. To distribute assets into depreciable items such as buildings and nondepreciable items such as land, and to estimate applicable depreciation rates
   b. To determine gift or inheritance taxes
5. Rental schedules and lease provisions
6. Feasibility:
   a. A development or redevelopment program
   b. A modernization or remodeling program.

Other needs may require an opinion other than market value, such as:

1. Insurable value—to serve the needs of insured, insurer, and adjuster
2. Going concern value—to serve for corporate mergers, the issuance of stock, or revision of book figures
3. Liquidation value or price—for forced sale or auction proceedings

4. Assessed value—to establish a uniform schedule and tax roll for ad valorem taxation, because this schedule may or may not be distinguished from a market value base.

Although this list does not include all of the needs for appraisals, it indicates the broad scope of the professional appraiser's activities.

An appraisal is an answer to a question which may be as limited as "What is the market value of this parcel of real estate today?" However, there are more complicated and sophisticated considerations. These may involve interests, equities, historical and future values, and other conditions. The answer to any question involving the value of an interest in real estate, under any assumed conditions, may be undertaken by the qualified appraiser, provided he fully and clearly states the question and his conclusion.

CHAPTER TWO

Nature of Real Property and Value

REAL PROPERTY has significance only as it satisfies man's needs and desires. Man's utilization of real property gives it character. Man's collective desire for real property gives it value. Real property is an indispensable accompaniment to human life and activity.

The measure of a property's value is the degree of its utility and the scarcity of comparable utilities. Land which is so remote from human activity that man cannot make use of it has no value. The soil of such land may be rich; it may abound in precious minerals; it may be located in a most agreeable climate and have scenic beauty; but it will remain valueless until its use is economically feasible.

Since land acquires value when it is desired and has a feasible use, the value thus imputed to a particular parcel of real property is not limited solely to the individual whose desires created it. Reflections of that value have significance for every other person whose welfare is or can be affected by its utilization.

"Under all is the land." The ramifications of this statement are as extensive as the statement is brief. Land is more than a mere physical foundation. It is vital to man's existence. It is the source of his food, as well as the foundation for the structures necessary to his social and economic activities. Because every man uses land, whether or not he owns it, an understanding of real property is based on comprehension of land's utilization by and for man.

Legal Concept of Real Estate

The legal concept of real estate is more comprehensive than is generally realized. The legal theory holds that land:

> . . . includes not only the ground or soil, but everything which is attached to the earth, whether by course of nature, as trees and herbage, or by the hand of man, as houses and other buildings. It includes not only the surface of the earth, but everything under it and over it. Thus, in legal theory, a tract of land consists not only of the portion on the surface of the earth, but is an inverted pyramid having its tip or apex at the center of the earth, extending outward through the surface of the earth at the boundary lines of the tract, and continuing on upward to the heavens.*

This concept that ownership of land extends from the center of the earth to the periphery of the universe was based upon the ancient maxim, *cujus est solum, ejus est usque ad coelum et ad inferos* (whose is the land, his it is, to the sky and the depths).

This figurative expression conveys the idea of full and complete ownership, but it is neither established law nor a rule of property. Examples of the limitation of ownership of air space are shown by acts of Congress, beginning in 1926, declaring that the United States has complete and exclusive national sovereignty in the air space over the nation;† and granting to any citizen "a public right of freedom of transit in air commerce through the navigable air space of the United States." "Navigable air space" is defined as "air space above the minimum safe altitude of flight prescribed by [the Civil Aeronautics Authority]."‡ The Authority fixed these altitudes at 1,000 feet over congested areas and 500 feet over other areas, including the necessary area for safe take-off and landing.§

It has been held that above the altitudes set by the Civil Aeronautics Authority, the air space is in the public domain but below

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* Robert Kratovil, *Real Estate Law* (5th ed., Englewood Cliffs, N.J., Prentice-Hall, Inc. 1969), p. 3.

† The Air Commerce Act of 1926 (formerly 49 USC §171 et seq.); and Civil Aeronautics Act of 1938 (formerly 49 USC §401 et seq.); and the Federal Aviation Act of 1958 (see 49 USC §401).

‡ 49 USC §180.

§ 49 USC 1301 (24).

them the government must pay just compensation where it interferes so substantially with the use and enjoyment of property as to amount to a taking.* In 1958 the Administrator of the Federal Aviation Agency was required to "give full consideration to the requirements of national defense, and of commercial and general aviation and to the public right of freedom of transit through the navigable air space."♦

In an opinion of the Supreme Court of the United States, Mr. Justice Rehnquist stated:◊

"The notion that a military plane on a high altitude training flight itself intrudes upon any property interest of an owner of the land over which it flies was rejected in *United States* v. *Causby,* 328 U.S. 256 (1946). There this Court, construing the Air Commerce Act of 1926, 44 Stat. 568, as amended by the Civil Aeronautics Act of 1938, 52 Stat. 973, said:

> It is ancient doctrine that at common law ownership of the land extended to the periphery of the universe.... But that doctrine has no place in the modern world. The air is a public highway, as Congress has declared. Were that not true, every transcontinental flight would subject the operator to countless trespass suits. Commonsense revolts at the idea. To recognize such private claims to the air space would clog these highways, seriously interfere with their control and development of the public interest, and transfer into private ownership that to which only the public has a just claim. 328 U.S., at 261.

Thus, quite apart from what would very likely be insuperable problems of proof in connecting the passage of the plane over the owner's air space with any ensuing damage from a sonic boom, this version of the trespass theory is ruled out by established federal law."

Where sonic booms occurred in the navigable air space, it has been consistently ruled that the physical invasion of the sound

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* *Aaron* v. *United States,* 311 F2d 798, 801, 802 (Ct. Cl. 1963); *Avery* v. *United States,* 330 F2d 640, 643 (Ct. Cl. 1964); *Griggs* v. *Allegheny County,* 369 U.S. 84, 82 S. Ct. 531 (1962).

♦ Pub. L. 85-726, Title III, §306, Aug. 23, 1958, 72 Stat. 749, 49 USCA §1347.

◊ Laird v. Nelms, 406 U.S. 797 (1972).

and shock waves therefrom, does not constitute a physical taking of property as opposed to a mere nuisance and trespass. Certain rulings▲ are not to the contrary, since the allowance of damages in that case was under the Federal Tort Claims Act [28 USC §1346 (b)], and resulted from an expressed willingness by the Federal Aviation Authority to pay damages resulting from certain sonic boom test flights.

Rights of ownership of land are subject to various limitations by the powers of government and private restrictions, as discussed later in this chapter, under the bundle of rights theory.

Distinction between Real Estate, Real and Personal Property

Misunderstanding exists as to the meaning of these terms. They have been defined as follows:

> REAL ESTATE—This refers to the physical land and appurtenances, including structures affixed thereto. In some states, by statute, this term is synonymous with real property.△
> REAL PROPERTY—This refers to the interests, benefits, and rights inherent in the ownership of the physical real estate. It is the bundle of rights with which the ownership of real estate is endowed.□
> PERSONAL PROPERTY—Generally, movable items; that is, those not permanently affixed to and a part of the real estate. In deciding whether or not a thing is personal property or real estate, usually there must be considered: (1) the manner in which it is annexed; (2) the intention of the party who made the annexation (that is, to leave permanently or to remove at some time); (3) the purpose for which the premises are used. Generally, but with exceptions, items remain personal property if they can be removed without serious injury either to the real estate or to the items themselves.*

As these definitions indicate, real estate, real property, and personal property are three totally different concepts. The distinctions between them are subtle. Being concerned with all

▲ *Avery* v. *United States, supra,* p. 643; *Kirk* v. *United States,* 451 F2d 690, 694 (CA 10, 1971); *Bennett* v. *United States,* 266 F. Supp. 627, 629, 630 (W.D. Okla. 1965). *United States* v. *Gravelle,* 407 F2d 964 (CA 10, 1969).

△ American Institute of Real Estate Appraisers, *Appraisal Terminology and Handbook* (5th ed., Chicago: Author, 1967), p. 163.

□ *Loc. cit.*

* *Op. cit.,* p. 151.

three, the appraiser has a thorough understanding of these distinctions and their significance. The chief characteristics of real estate are its immobility and tangibility. It comprises land and all things of a permanent and substantial nature affixed thereto, whether by nature or by the hand of man. By nature is meant trees, the products of the land, natural resources; by the hand of man, those objects—buildings, fences, bridges—which he erects upon the land. All equipment or fixtures such as plumbing, electrical, heating, built-in cabinets, elevators, which are installed in a building in a more or less permanent manner, usually are held to be a part of the real estate.

Real property may be said to be a composite term because it embraces the tangible (physical) elements of real estate plus those intangible attributes which are the rights of ownership. The appraiser is concerned with real property since he estimates the value of the rights and benefits to be derived from the ownership of real estate.

The chief characteristic of personal property is its mobility. Furniture and furnishings, office equipment, livestock and farm machinery, mortgages, and securities of every type—practically anything which the owner can move about at will—comprise personal property.

Sometimes the distinction between personal property and real estate is so fine that it has required the opinion of the courts to resolve the issue. The necessity for classification or distinction has given rise to the law of fixtures wherein the basic theory holds that a fixture is:

> . . . an article that was once personal property, but that has been installed in or attached to land or a building thereon, in some more or less permanent manner, so that such article is regarded in law as a part of the real estate.†

The distinction between personal property and real estate is important to the appraiser, for if a fixture were personal property,

† Kratovil, *op. cit.*, p. 8.

its contribution to the value of the real property could not be considered. But if the fixture were real estate, then its contribution to the value of the real property could be considered.

Because the distinction between real estate and personal property is not always evident and because it is important in the valuation of real estate, the appraiser should be familiar with the law of fixtures as it applies in the area in which he practices. When the law is not clear concerning an item, the appraiser may abide by local custom. However, in his appraisal report he should state clearly the distinction made.

Bundle of Rights Theory

This theory holds that the ownership of real property may be compared to a bundle of sticks wherein each stick represents a distinct and separate right or privilege of ownership. These rights inherent in ownership of real property and guaranteed by law, but subject to certain limitations and restrictions, are the right to use real property, to sell it, to lease it, to enter it, to give it away, and the right to refuse to exercise any of these rights.

While the legal definition of land implies complete ownership of land and everything attached to it, under it, and over it, legal title to land in fact does not convey absolute fee simple title to real property and the unrestricted exercise of the entire bundle of rights. These rights and privileges are limited by four powers of government:

1. The power of taxation.
2. The power of eminent domain. This is the right reserved by government to take by condemnation private property for public benefit provided it pays just compensation therefor. This right has been extended to quasi-public bodies such as housing authorities and to public utilities. There is an apparent trend toward a broader interpretation of these rights and powers of government as the concept of what constitutes public benefit broadens.
3. The police power. This is the right to regulate property for promoting the public's safety, health, morals, and general welfare. Zoning ordinances, building codes, traffic regulations, and sanitary regulations are based upon the police power of government.

4. Escheat. This is the right to have titular ownership of the property return to the state if the owner does not pay his taxes, or if the owner dies leaving no will and no known or ascertainable heirs.

In addition to governmental restrictions upon property, legal private agreements also may impose restrictions. These could limit the use or manner of development, or even the manner in which ownership can be conveyed. These are called deed restrictions, and a purchaser of a property so encumbered may be obligated to use the property subject to such restrictions. Other private restrictions include easements, rights of way, and party-wall agreements. For example, an owner can sell or lease the mineral rights while retaining the rights to use the surface area of his property. An absentee property owner can rent his surface rights to one party and lease the subsurface rights to another. Air rights, whether for construction or avigation, can be sold or leased. Thus some of the rights may have been severed from the property by sale, lease, or gift to other parties before a property is acquired.

The remaining rights in the bundle, subject to the limitations imposed by governmental and private restrictions, can also be sold, leased, transferred, or otherwise disposed of. Therefore, an appraisal of a property's value involves consideration of the rights remaining with the property and the effect of the loss of any of these private rights on its value as a whole. Knowing exactly which rights are under consideration is fundamental in appraising. Their precise definition customarily is a matter of documentation. In the absence of such definition, it may be necessary to obtain legal opinion. The appraiser, however, should be generally familiar with the broad range of property rights, their more common characteristics, and the usual manner in which they are utilized and transferred.

Meaning of Value

Value is the key word that links the different segments of the real estate business. Value plays an important part in each real

estate activity. A buyer or seller bases his offering or asking price on his opinion of value. The brokers' and managers' concern with value is important for their own interests, as well as for advising their clients as to realistic sale prices and rental rates. The builder who is not cognizant of the value involved cannot know what to build, where to build, and when to build. The mortgage holder must have knowledge of value if he is to protect his capital. The appraiser is directly concerned with value because his primary function is to estimate value.

The significance and importance of value to the real estate vocation would imply that its meaning is precisely and clearly defined, thoroughly understood, and so utilized in all real estate activities. Unfortunately, this ideal condition does not exist. Rather, value is given many interpretations.

The reason for this is not difficult to understand when even a modest-sized dictionary may list as many as 10 definitions for the word value. It means one thing to the artist, another to the musician, still another to the scientist. This tendency to interpret value in terms of specific social and economic activities is so widespread that to find it in the real estate field is not strange. Lending institutions may use the term "loan value" and brokers may use the term "sales value" when they mean "market value." The assessor refers to "assessed value," and casualty insurance companies refer to "insurable value."

Terminology is a major part of the student's curriculum. It is essential to the appraiser because terminology is the medium through which he expresses his estimate of value. He must understand the meaning of these terms to use them correctly. The appraiser recognizes also that the terminology of the real estate appraisal profession is not static because events require modification of existing definitions.

Evolution of Value Theory

Concern with the meaning of value has intrigued scholars, writers, philosophers, and economists for centuries. From the time of

Aristotle until the middle of the 16th century, views expressed on value were often incidental to the philosophical discussion of other subjects. Thereafter, value theories were accorded greater consideration by economic theorists. The history of the evolution of value theory, particularly after the 16th century, can be found in many books on economics.‡ The contributions made by the more significant schools of economic thought are indicated in the next few pages.

Theories of Mercantilists. From the 16th to the 18th centuries in England, a group of businessmen, the Mercantilists, began more relative discussions of the subject of value. The Mercantilists, who traded extensively, believed that individual economic well-being was possible only in a strong economic state. This required strict control of productive agencies, particularly land and the means of transportation.

The Mercantilists approached a clear analysis of subjective value when they considered desire as a factor in value. Land had no cost of production, yet it was valuable because people desired it. However, the Mercantilists made most of their contributions in the field of value in their considerations of price or value in exchange. They were interested in competition and its effects on price, and had a basic understanding of the principle of supply and demand as it affected price.

Theories of the Physiocrats. About the middle of the 18th century, a group of philosophers known as the Physiocrats further added to economic theory by laying the foundation for today's concept of economic rent. They held that only land contributes anything in excess of production cost and that wealth has no value beyond the possibility of exchange. The Physiocrats emphasized the right of the individual to own property, and held that the state should guarantee freedom in contract for its people. They stressed

‡ For example, *see* L. H. Haney, *History of Economic Thought* (4th ed., New York: The Macmillan Company, 1949; Arthur M. Weimer, "History of Value Theory for the Appraiser," *The Appraisal Journal,* October 1960, pp. 469–483; Paul A. Samuelson, *Economics* (9th ed., New York: McGraw-Hill, 1973).

land as the elemental productive agent, yet failed to give proper credit to industry and commerce as equally potent in the production of wealth.

Cost Theory of Adam Smith. Toward the end of the 18th century Adam Smith's *Wealth of Nations* furthered economic thinking in one historic step. Smith was primarily interested in value in use. His concept of value was entirely objective. Although it may be assumed to be exclusively a cost production theory, it is more refined than any cost of production theory which had gained previous general acceptance. Before Adam Smith's time, labor was considered the primary and, in most cases, the exclusive cost of production. He introduced the concept of capital. The cost of the use of capital is an essential function in Smith's idea of value even though he was greatly influenced by the labor theory of value.

Rent Theory of Ricardo. Ricardo further contributed to the evolution of the value concept with a theory of economic rent. According to Ricardo, value is determined by scarcity and the quantity of labor required to produce commodities. In his analysis, capital costs entered as production costs. But because Ricardo considered capital to be merely stored-up labor, all costs in the final analysis were reduced to labor costs.

According to Ricardo's concept, rent is a differential payment made possible by the varying productivity of the land. As long as man can get all the land he needs for nothing, no rent will be paid. As population increases and as the prices of farm products advance, the better grades of land become scarce and some farmers are forced to take poorer lands. When farm products are higher priced, poorer lands pay the cost of operation but not rent. As the pressure of population increases and the prices of farm products rise, the less productive lands come under cultivation, and more and more rent can be charged for the better grades of land. Thus, in a sense, rent is a differential paid for the better grades of land.

Ricardo's concept maintains that rent does not enter into the cost of production. Costs are determined on the marginal land—that land cultivated to produce enough to pay labor and capital

costs but not rent. This reduces value to labor cost, or the wages of labor, and the price paid for capital which Ricardo considered stored-up labor. Ricardo's principal contribution was his definition of rent: "That portion of the produce of the earth which is paid to the landlord for the use of the original and indestructible powers of the soil."

Since Ricardo's time, a number of economists have contributed theories which helped to shape the present concepts of value. They include Malthus, Johann Heinrick von Thünen, Frédéric Bastiat, Henry C. Carey, John Stuart Mill, Karl Marx, and a group identified as the Austrian School. The more important reflections of each of these economists are required to show the trend of economic thought and the historical development of the present concepts of value.

Scarcity Theory of Malthus. Malthus, like Ricardo, understood the marginal theory of rent. However, he gave considerably more emphasis to the supply and demand factor; this was his principal contribution to the theory of rent.

Malthus is better known for his theories on population. He proposed that population necessarily is limited by the means of subsistence. Population, he observed, invariably increases where the means of subsistence increases unless there is some powerful contrary force. Malthus predicted that population would exceed the food supply within the measurable future. His rate determinations were faulty, and he failed to anticipate future technological gains in agriculture.

Von Thünen was one of the first land economists to distinguish clearly between the contribution made by capital and the contribution of the land itself. (Ricardo's writing indicates that he was confused on this subject.) Von Thünen recognized and was interested in the effect of location of land on its value.

About the same time—1825 to 1850—Bastiat contributed some unique theories on land value. Influenced by the abundance of unimproved land in America, Bastiat held that the entire value of land lay in the improvements. He observed that land had no

value other than the effort expended in clearing it, and building on it, and the general improvements on or in the vicinity of such land. Logically, he said that the landlord should receive payment only for the services of these improvements which were contributions of labor. The worth of the labor represented by the improvements could be calculated on a present value basis, thus establishing the value of the land.

In the 19th century, Henry C. Carey, a Philadelphian, wrote that the expenditure of labor on land was the sole reason for its value. Carey identified land as capital and stated that "capital invested in land differs in no respect from capital invested in other machinery." Rent, he stated, "is only interest for capital invested." Carey is considered to be the first American to advance the theory that value is the cost of replacement depreciated.

Social Theory of Mill. John Stuart Mill approached the subject of land value from the social philosopher's viewpoint. Unlike many of the early economists discussed here, he cannot be classified as a businessman economist. Mill is best known for his theory of the unearned increment of land which he proposed to abolish through taxation. He recommended that the government make a periodic valuation of all lands, urban and agricultural, and take over the increase of value. Because he made no provision for indemnity to property which showed a decrease in value, it is presumed that Mill expected all land to increase in value indefinitely. Application of his theory would result in eventual government confiscation of all land.

Labor Theory of Marx. Karl Marx is considered by some to be the founder of modern socialism. His principal writing was done during his exile following the 1848 revolution, and culminated in the publication of *Das Kapital* in 1867. During this period, the sweep of philosophic progress began to include human desires and social benefits in relation to property ownership and value. How much the times contributed to Marx, or Marx to the times, is a subject of controversy. Marx regarded value as "a mere congelation of homogeneous human labor." This labor theory of value

was not a new concept, but Marx exposed and promoted it with a crusader's zeal. His work tends to mark the beginning of a trend shifting value theory from a primarily materialistic concept to one theoretically centering on human interests and social welfare. Previously, the theory had been largely academic; after Marx, it was no longer limited to the hypothetical economic man. To be valid, any value theory had to meet the requirements of the businessman and of society, generally, as well as the academicians. Marx wrote during the time that this principle of social welfare was gaining acceptance; and perhaps he is given more credit for influencing the transition than is merited. However, in its various national applications, in the years since *Das Kapital* was published, Marx's theories have undergone many conceptual changes, with myriad interpretations.

Theories of Austrian School. The theory of price in its relation to value reached its first complete development through the writings of the Austrian School, a group of economists who advanced their beliefs during the last half, and particularly in the last quarter, of the 19th century. Leaders in this group were Eugen von Bohm-Bawerk, Friedrich von Wieser, and Karl Menger. Other members included Hermann Heinrich Gossen and an Englishman, W. S. Jevons. Utility was the keystone of the value theory advanced by this school. They discussed a "normal value" which was the value established under conditions of balanced supply and demand. Price, considered to be the function of marginal utility, was established at that point at which the seller would not part with his property for one cent less and the buyer would not pay one cent more. This school of economists, then, contributed to the theory concerning the relationship between market price and value.

This brief account of the history of value theory demonstrates that value is a word of many meanings. Because it is the symbol of ideas, it cannot be defined precisely.

Oliver Wendell Holmes, Associate Justice of the Supreme Court, placed emphasis on this concept in these words:

> A word (value) is not a crystal, transparent and unchanged; it is the skin of a living thought, and may vary greatly in color and content according to the circumstances and the time in which it is used.§

Significance of Value Theories

Because value can have many interpretations, the meaning used in the valuation of real property is important. In the *Appraisal Terminology and Handbook*★ the emphasis is put on the relationship between a thing desired and a potential purchaser. The important word in this definition is *relationship*. This means that the value of an object is related to something. It has been pointed out that there must be a need for an object to give it value. But that does not go far enough; there must be some other factor or factors present. The belief that need alone creates value would imply that value is a characteristic inherent in the object itself. If this concept were true, then bread would be intrinsically valuable because it is needed to satisfy hunger. But hunger is limited. If bakers were to produce twice as much bread as needed to satisfy all normal hunger, then half would have little, if any, value. The value of the bread, then, is not intrinsic but depends upon the relationship between bread and hunger.

An object cannot have value unless it has utility; that is, unless it is able to arouse the desire for possession and has the power to give satisfaction. This depends in most instances on the usefulness of the object, but utility encompasses more than mere usefulness. A useful object may and may not have utility at the same time, depending on the desires of different individuals. For example, bread has great utility to a hungry man but much less to one who is not hungry.

Although without utility, value cannot exist, utility alone is not sufficient to give an object value. Scarcity also must be present before value exists. Air has the highest possible utility but air is not scarce. No object, including a parcel of real estate, can have

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§ Towne *v.* Eisner, 245 U.S. 418.

★ *Op. cit.*, pp. 207–208.

value unless it possesses in some degree the two factors of utility and scarcity.

As in the case of utility alone, however, the presence of only utility and scarcity does not create value. Another factor is necessary if an object is to have value as the appraiser defines it. This factor is purchasing power, or the ability of the individual to participate in the market in order to satisfy his desire.

The appraiser's interpretation of value, then, can be summarized as follows:

> Value is not a characteristic inherent in real property itself, but depends on the desires of man. It varies from person to person and from time to time, as individual desires vary.
>
> An object (real property) cannot have value unless it has utility. Utility arouses desire for possession and has the power to give satisfaction.
>
> Utility alone does not give an object (real property) value. It must also be relatively scarce. So utility plus scarcity are two of the elements creating value.
>
> Utility and scarcity together do not confer value unless they arouse the desire of a purchaser who has the purchasing power to buy.

The characteristic of permanence complicates the estimation of the value of real estate. Unlike goods which are rapidly consumed and the utility obtained at once, the benefits of real property are realized over a long term. Land and its improvements have a useful life extending over decades. The value of real property, consequently, is equal to the present value of the future benefits forthcoming from the property. Estimating the market value for the highest and best use is the paramount problem in the valuation of real estate. Any such estimate must take into consideration social and economic trends which may influence the value for its highest and best use. It is essential to have a clear understanding of current conditions and the perception to recognize the forces that modify and change these conditions.

The appraiser, in considering these factors, should never lose sight of the fact that he is really interpreting the reactions of

typical users and investors. Appraisers do not make value; they interpret it chiefly from market evidence.

Value in Use versus Value in Exchange

As developed earlier in this chapter, the value concept has been the subject of investigation and discussion among economists and, before them, philosophers and law makers for many centuries. Their thinking resulted in separating the general concept of value into two categories. Value in exchange or market value is one; the other is the value or the importance of an object to the owner who may have no intention of exposing it on the open market.

In defining value, a distinction must be made between value in use and value in exchange (market value). Value-in-use computation is generally appropriate when:

1. The property is fulfilling an economic demand for the service it provides or which it houses.
2. The property improvements have a remaining economic life expectancy.
3. There is responsible ownership and competent management.
4. Diversion of the property to an alternate use would not be economically feasible.
5. Continuation of existing use by present or similar occupants is assumed.
6. Due consideration has been given to the property's functional utility in best serving the purpose for which it was constructed.

When these factors appear, the appraiser, qualifying his findings, may consider the propriety of giving an opinion of "value in use." The cost approach, duly reflecting existing functional lack of utility and reflecting economic depreciation as well as physical deterioration, may be applied in such situations. All measures of the economic contribution of the real estate to the total "going concern" situation are relevant. Typical examples of property situations where the value-in-use concept holds validity include these: valuation of an electric power plant or railroads in a non-competitive situation; valuation of public buildings or quasi-

public facilities, including schools, churches, libraries, or sports arenas. Less restricted types might include steel plants or other single-use industrial facilities.

A property may have one value in use and quite a different value in exchange. The design and specialized installations of a building can so affect its utility that its economic value might be realized only through a special use. However, in many instances it will be found that there is no current competitive demand for such a specialized building.

A commonly encountered assignment in the industrial real estate field is to estimate the value in use of a given parcel of real estate. This may function as a basis for asset valuation in a merger, or in a going concern situation, such as a security issue, or simply as a value judgment of the worth of a property to its present owner.

The many qualifications of the word value have resulted in some confusion. Common phrases in the area of real property may also include, among others, assessed value, going concern value, insurable value, liquidation value. These qualifiers reflect the proposed use of the value estimate, and are used in those areas of the real estate field which may not be directly concerned with the estimation of market value.

The varied interpretations of value reflected in the decisions and opinions of the courts have contributed to the confusion. Not all courts subscribe to identical definitions of value, but generally they rely upon prices paid for comparable properties as the major evidence. There have been exceptions occasionally in the field of condemnation and in public utility valuation generally. A legal determination may settle a controversy, but that determination should not be regarded as having unquestionable validity beyond the particular situation to which it was applied.

The problem becomes complicated when property is not commonly exchanged in any identifiable market, and does not fall into a rental category where sufficient rental data exists to constitute a basis for analysis using the income approach to value.

In an economic sense, the value of real property in the market, or market value, may be the primary concern in a real estate appraisal, because market value reflects the reactions of buyers, sellers, and investors. Unless there is no market—neither existing nor potential—market value is usually sought. Accordingly, most real estate appraisal assignments involve estimates of market value. This has been defined in various ways in different parts of the United States, because most definitions have been taken from decisions in eminent domain cases. The most widely accepted definitions of market value are:

1. . . . the highest price estimated in terms of money which a property will bring if exposed for sale in the open market, allowing a reasonable time to find a purchaser who buys with knowledge of all the uses to which it is adapted and for which it is capable of being used.
2. Frequently, it is referred to as the price at which a willing seller would sell and a willing buyer would buy, neither being under abnormal pressure.
3. It is the price expectable if a reasonable time is allowed to find a purchaser and if both seller and prospective buyer are fully informed. . . .♦

The subjective premise is embodied in this definition. The elements of utility, scarcity, desire, and purchasing power are included. It is somewhat idealized in implying that buyer and seller are working under equal pressure, which is seldom the case.

Buyer-Seller Subjective Value Concepts

Whereas the real estate appraiser is primarily interested in market value, the courts, accountants, engineers, architects, and other professions have other criteria of value. These include value in use, capital value, intrinsic value, replacement value, scrap value, residual value, and book value. However, all of these value denominations relate to the basic economic concept that value is not inherent in an object but depends on the relation of the

♦ American Institute of Real Estate Appraisers, *Appraisal Terminology and Handbook* (5th ed., Chicago: Author, 1967), p. 131.

object to man's unsatisfied needs or desires. Thus there are two aspects of value: one being the supply and availability of an object; and the other, the effective demand for the object, demand being a direct reflection of usefulness or utility to present or prospective owners or users.

Although this text is primarily oriented to market value of real estate, there is no disposition to exclude the possibility and indeed the desirability of expanding the application of the appraiser's expertise to other related fields of valuation. In such matters he should, however, avoid infringing upon the prerogatives of other professions unless he can qualify himself as an architect, an accountant, an engineer, or an expert in any other specialties that may be involved in valuation problems other than market value. In many business transactions characterized by specific conditions of ownership or operation, the value assigned to certain parcels of real estate by owners or prospective purchasers may differ from that indicated by the potential price obtainable in the open market.

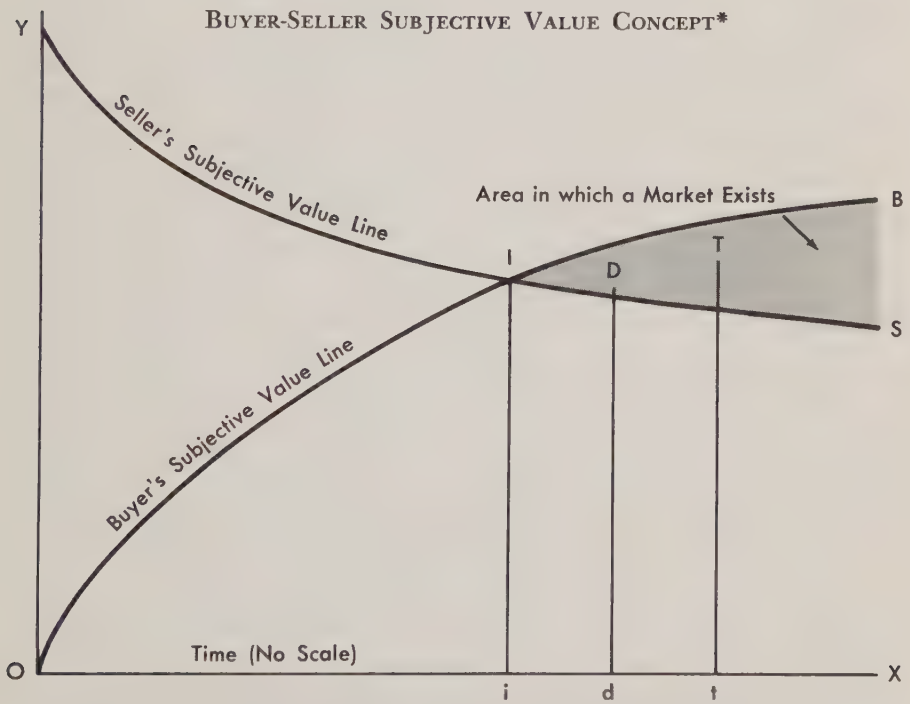
Probably the most significant difference between the real estate appraiser's approach to value and that of most other professions in the wide field of valuation is that he estimates and provides an opinion of market value in that type of market in which the property to be appraised has an indicated demand. Hence, his interest in the property is not in its value to one particular owner or to one particular user, unless it can be shown that he is indeed typical of owners or users in the market.

It must be recognized that only a small portion of all real estate is placed on the market. Some of it never has been on the market and much of it may never be, within the foreseeable future. Yet no one should say that it has no value. It may have a value to the community at large, contributing something to each parcel of real estate in that community, or as a national park or forest preserve. It may have no calculable realistic contribution to make to any particular piece of real estate in its immediate vicinity or

even in the nation, but may be of value because of its present or prospective service to the community as a whole.

Graphic representations are useful to illustrate value concepts and to form bases for statistical study of economic phenomena. The following diagram of the Buyer-Seller Subjective Value Concept may at first seem similar to the familiar "supply and demand curve." It is, in fact, quite different, reflecting another type of relationship. As the result of the buyer-seller relationship is necessarily subjective, it must be considered as a tendency, rather than a mathematical conclusion.

Curve YS represents the subjective value estimates at various times for a parcel of real estate as assigned to it by the owner



* Thurston H. Ross, *Some Economic Aspects of Urban Land Valuation* (University of Southern California, Los Angeles, 1933).

of the fee or owner of the right to use the property. Any vertical distance from the base line OX to the curve YS represents the subjective value at that point in time, under the then prevailing conditions, as estimated by this owner.

The curve OB represents the subjective value estimates at various times, as assigned to the property by a prospective buyer who is assumed to be a typical buyer in the market. This curve need not pass through O but may have its origin at any point along OY. The prospective buyers' estimates of value usually form an ascending curve while the owner's or seller's curve frequently descends. Any vertical distance from the base line OX, either to the owner's curve YS or the prospective buyer's curve OB, represents their estimates, respectively, of the property value at that time. The time line, OX, is relative, for illustration only, and the scale is not indicative of any fixed time intervals.

The curves YS and OB intersect at I where the value estimates of the owner and the prospective buyer coincide. The distance iI is the measure of value where neither the buyer nor the seller would gain from a transfer at the expense of the other. They would simply be trading dollars. Each may be evaluating different attributes of the land, the building, or the property as a whole, or each may be using a different rate of capitalization, but the results of their valuations are the same.

At any position to the left of iI the value estimated by the owner is greater than that estimated by those who might be interested in purchasing. Transfer would not be anticipated to the left of iI. However, to the right of iI, depending on the actual shape of the two curves, the owner's value estimate may be less than that of the prospective typical purchaser, whereas the latter's may be higher than the former's. It is in this shaded sector (between IB and IS) that a market exists; here the real estate appraiser's activity centers. It is here that a willing buyer and willing seller can adjust their estimates to agree upon some market price. In other words, what has been illustrated by the foregoing analysis is that the economic man wants to receive as much as

he can, and pay no more for the property than is justified in the market.

The zone of dispersion between IB and IS is the area of negotiation and the area within which market value will be found. As it is the area of negotiation, within its limits, adjustments to the "trading dollars" price at iI will be made. The seller must be convinced as a result of negotiation or a revision of his opinion of value that he can afford to take less, or the buyer must be convinced that he can pay more; and the appraiser must satisfy himself, after taking into consideration all factors influencing the market, that he can certify to an opinion of market value at some point in this area, say at dD, where a sale can be made; or if he expresses an opinion that allows additional waiting time, Point tT could be reached.

The above concept is not presented as new. It illustrates the fact that at any given period of time, the great majority of properties are not available for sale at a price at which many buyers will purchase. It is usually only in those cases where the owner lowers his price and the prospective purchasers raise theirs that a transaction is consummated.

There are many factors which may influence either buyer or seller. For example, the prospective buyer may have several competitive properties which he could purchase and may consider in comparison with the subject offering. He compares the cost of capital assembly; he is influenced by available interest and amortization rates and terms of prospective financing. Capital capacity even within a small group of sophisticated purchasers may vary greatly and their effective costs of money may influence their decision as to the price they will pay. Tax advantages are also important factors and depreciation allowances often are dominant elements in value estimates. Immediate need is also a factor, as are many other considerations.

So far as the seller is concerned, he may be influenced by personal factors including the specific profit, capital reinvestment costs, capital gains or other forms of income tax, selling costs, and

various options he might have for his own continued use of the property.

All of these considerations on the part of prospective buyers and the seller are subjective. The function of the appraiser is to analyze all such factors which are apparent in the market place and resolve them to an estimate of market value; this would be the price most reasonably expected, for a typical buyer to pay and a seller to accept, at any one specified period of time.

Summary

Land is essential for all human activity, but its value is dependent upon its usefulness, including all of its improvements, together with appurtenant property rights. Real property is distinct from personal property, generally movable items.

Land ownership is limited by governmental powers and frequently by private restrictions and agreements.

There are many facets to the term "value," but the real estate appraiser is usually interested in market value. The field of economics has long been concerned with analysis and interpretation of value concepts, classifying them in two broad categories: value in use and value in exchange.

The legal definition of market value becomes a most significant guide for the real estate appraiser who is responsible for making his analysis and formulating an opinion of value (usually market value). This opinion falls within a negotiating range between buyers and sellers, each of whom has his own subjective reactions to the individual offering.

In arriving at any market value conclusion, the appraiser takes into consideration all of the factors which influence the conditions of this market and make an impact on its buyers and sellers. The significance of the real estate appraiser's opinion depends on his skill and thoroughness in the analysis of the actions of buyers and sellers in the market place, and on his ability to interpret these actions in terms of the property being appraised.

CHAPTER THREE

Basic Principles of Real Property Value

Wealth is the composite of economic goods in or on the land, subject to public or private use. Property is the right of use of the economic good. Appraising as considered in this text, then, is the valuation of rights of use, or ownership of real estate.

The principles of land utilization are founded in economics. Because appraising is the estimation of value of the rights of use of real property, the basic economic principles also underlie the procedures of valuation. A comprehension of these principles is essential to an understanding of the procedures of valuation.

Anticipation

The principle of anticipation affirms that value is created by the expectation of benefits to be derived in the future. It is not the past but the future which is important in deriving opinions of value. The primary value of past experience arises from its significance for the estimation of possible future trends and conditions. A buyer of income property invests in anticipation of future benefits, to be achieved through possession, operation, or in the form of capital gain. He examines a property's income experience to discover all the factors, favorable or unfavorable, which have made it possible for this property to produce that income. He then analyzes the assembled data and weighs all of the appropriate factors in order to form an opinion whether the net income stream may be expected, under typical management

and business conditions, to continue, to decline, or instead to increase.

Value is defined as the present worth of the rights to all prospective future benefits, tangible and intangible, accruing to ownership of real estate. In most cases the quantity, quality and duration of future benefits may be estimated in the light of past experience as disclosed by results of operation of the subject and comparable properties.

Recent sale prices of comparable properties indicate the attitudes of informed buyers and investors in the market concerning the present value of these anticipated benefits of ownership of a particular property. However, the value of an individual property is not necessarily established by its past selling price nor by the cost to create it.

Substitution

This principle holds that when several commodities or services, with substantially the same utility, are available, the one with the lowest price attracts the greatest demand and widest distribution. The importance and application of this principle can be found in many segments of the economy. In real estate, for example, if two apartments offer approximately the same advantages, the prospective tenant will select the one with the lower rent.

The basic methodology of the appraisal process is found in the three approaches to value (as presented in the following chapter). This principle of substitution applies to each of them as follows: In the market data approach, applied when a property is replaceable in the market, its value tends to be set at the cost of acquiring an equally desirable substitute property, assuming that no costly delay is encountered in making the substitution. In the cost approach, no rational person will pay more for a property than that amount by which he can obtain, by purchase of a site and construction of a building, without undue delay, a property of equal desirability and utility. In the income approach, value tends to be set by the effective investment necessary to acquire,

without undue delay, a comparable substitute income property offering an equally desirable net income return.

Properties such as schools, churches, transportation terminals, and hospitals exist in a limited number because of their specific use characteristic. In the valuation of a property of this type, it is difficult to find comparable substitute properties; therefore, the use of the market data approach is rarely appropriate. The cost approach is usually the most effective method to obtain a value indication for such properties. The cost approach principle given above can be applied by estimating the current cost to produce a comparable new property affording equal utility and benefits. Then, because the property being evaluated is not new, the cost new figure must be adjusted to reflect the estimated loss in value due to depreciation.

The principle of substitution provides the basis for these premises:

1. The market value of property tends to approach the value indicated by the actions of informed buyers in the market for comparable real estate having similar physical and economic characteristics.
2. The cost of producing, through new construction, an equally desirable substitute property usually sets the upper limit of value.

Change

Change is constantly occurring. In real estate it affects individual properties, neighborhoods and cities. These changes can be evolving so slowly that their movement is almost indiscernible. The real property and its environment, with the probability and rate of change, should be examined to recognize not only the obvious, but also the subtle indications leading to change, which may be apparent only to the experienced observer. The future, not the past, is of primary importance in estimating value.

The appraiser is concerned with transition, not permanence. He recognizes the economic and social forces at work, and weighs the present and future effects of these forces on the value of real property. The more trends influencing the real estate market that

the appraiser can perceive, the more effectively he can estimate their impact on the market value of a parcel of real estate. Individual properties, districts, neighborhoods—sometimes entire cities and towns—may follow a pattern of growth in desirability, passive existence, and eventual decline in desirability and usefulness.

The concept of regression maintains that between dissimilar properties or things in the same classification, the value of the superior property or thing is affected adversely by the presence of the inferior. For example, in a residential block where the average value of a home is $22,000 to $25,000, there is a high-quality home which would be valued at $40,000 if it were located in an area of similar high-quality homes. In its present location the value would tend to approach that of neighboring properties. People in the market for homes in the $22,000-to-$25,000 range look for them in neighborhoods where that price range predominates. They might appreciate the additional features and amenities of the $40,000 house, but be unable or unwilling to purchase it. A few might pay somewhat more for it; but rarely would the owner be able to obtain the full $40,000 for his property. Typically, a person seeking a $40,000 property would look in neighborhoods with houses at that figure, where neighbors would be expected to have similar backgrounds and interests.

The concept of progression is the opposite of regression; that is, the value of a lesser object is enhanced by association with better objects of the same type. If the situation in the preceding example were reversed and it were a $22,000 house among homes of $40,000, the $22,000 house probably could bring a somewhat higher price in the market. A person who aspires to live in that neighborhood, but is unable to afford a $40,000 home, might pay more for this $22,000 house in a neighborhood of better houses.

In the market, the value of a property has its basis neither in a price paid for it in the past, nor in the cost of its creation, but rather in the prospective amenities and uses that buyers and sellers believe it will provide for them. The actions of the market (sales) reflect informed investors' opinions of the probable future

benefits of ownership. The attitude of the market toward property in a specific neighborhood reflects the probable future trend of that neighborhood.

The law of change is fundamentally the law of cause and effect.

Competition and Excess Profit

The principle of competition stems from the fact that profit tends to breed competition and excess profit tends to breed ruinous competition. Profit is defined as that portion of the net income produced by real property over and above the costs of labor, capital, coordination, and land. To avoid confusion it should be understood that profit as applied to real property is not the same as profit obtained from the operation of a business. Normal business profit is the monetary incentive and reward for capital investment. The yield on a real property also is the monetary incentive for investment in land and buildings. Profit, then, as it is considered by the appraiser in the analysis of income and expense of a real property, is the prospective net income remaining after operating costs and adequate returns on land and buildings have been satisfied. In other words, it is what remains after providing for the agents in production.

The first merchants locating in an area where their services are needed may make large profits. Competing merchants thus are attracted to the district. These newcomers share in the total amount of available business, i.e., the volume of business initially enjoyed by the pioneer merchants declines, and so do their net incomes. This process may continue until few, if any, merchants make a satisfactory return. Competition, by dissipating the net return, has reduced net yield to land, and thus its value. Eventually, all profit can disappear if the expansion of competitive services continues beyond the point of economic demand.

However, excess profit may result in increased land value. For example, a store in a new and expanding district has a five-year percentage lease with a minimum rental of $6,000 per year. Suppose this percentage rent is $2,000 the first year, and $4,500 the

second year, then drops off to $2,500 and $2,000, and finally to $1,500 per year because of increasing competition. Perhaps the base rental at the end of the initial five-year lease should be increased to $7,500 per year. If the operating expense and the cost of building and amortization have increased only slightly, then most of the permanent increase in rent is additional yield on the land, increasing its value. In this instance, there must be a decision as to which portion of the surplus income is a temporary profit, and which part is likely to be a continuing return on the increased value of the real property.

In appraisal practice, surplus income is valued by treatment as a short-term annual profit. If the indicated surplus income for a three-year period were $2,000 per year, then the value of the profit might be estimated by referring to the tables for the present value of an ordinary annuity at an appropriate rate of interest.*

Critical elements affecting interest and capitalization rates are quantity, quality, and duration or timing of prospective income and reversionary gain or loss. The quantity of income is the amount to be capitalized; that is, net before recapture. The quality of income reflects its relative dependability. Interest rates may be derived by the band of investment procedure, by comparison of quality attributes, or by direct comparison and extraction from the market. This will be dealt with and explained in subsequent chapters.

Competition is one of the most familiar and easily recognized forces present at all levels of economic activity. Reasonable competition stimulates further creative contribution; but in excess, it can destroy that which it attempts to create. The appraiser not only recognizes its presence in normal situations, but he perceives those situations in which it is weakening and may destroy value, if unchecked. Competition is a product of supply and demand; a proper study of the highest and best use of a property includes current supply and demand factors.

* See Appendix B, Tables.

Increasing and Decreasing Returns

The principle of increasing and decreasing returns affirms that larger amounts of the agents in production produce greater net income up to a certain point (the law of increasing returns). At this point, the maximum value has been developed (the point of decreasing returns). Any additional expenditures do not produce a return commensurate with these additional investments (the law of decreasing returns). The fertilization of farm land affords a simple example of these laws. Increasing the use of fertilizer results in a greater yield, up to a certain point. Beyond this point, however, increasing the use of fertilizer does not produce an additional return sufficient to warrant the additional cost.

It is frequently necessary to determine the character and size of the structural improvement which will enable the land to produce the greatest net yield. To ascertain this point, hypothetical combinations of probable income and expense factors and capital requirements for improvements of various types and sizes should be analyzed. Certain combinations may represent higher or lower probable yields.

This process of developing hypothetical improvements to obtain the combination of the agents in production which will return the greatest net yield illustrates the principle of increasing and decreasing returns. It applies also in the estimation of highest and best use—that use indicating the greatest net yield.

Contribution

The principle of contribution is actually the principle of increasing and decreasing returns applied to a portion or portions of a real property. The value of an item in production is measured by its contribution to the net return of the enterprise. Enterprise in this sense means the combination of all items in production such as land, buildings, and all other improvements.

The value of any part of a structure or a service provided to the occupants must be economically justified by its influence on

the structure's productivity (income or occupancy) and utility. Any remodeling project of an existing building must so justify itself. For example, the expenditure of $15,000 to convert a basement into an apartment, or to add a recreation room to a home, is justified only if the result is the production of additional value, in excess of the amount spent. Similarly, the installation of modern automatic elevators in place of the old ones should increase the net income—by either a reduction in operating expense or an increase in rentals—to some amount in excess of a fair return on, and a recapture of, the cost of installation.

The principle of contribution is applicable in valuing lots of varying depths, in that it is necessary to know the value, if any, which the additional land contributes to its parcel over and above the value of the standard-depth lot in the area. In the reverse situation where a lot is shorter than standard, its value would reflect this loss of contribution by the value of that portion by which it falls short of conformity to the standard. With a practical bearing on many valuation problems, the application of this principle is fundamental to any consideration of the feasibility of remodeling or modernization.

Surplus Productivity and Balance

Surplus productivity is defined as the net income remaining after the costs of labor, capital, and coordination have been paid. This surplus may often be attributed to the land in its present use. Surplus productivity is dependent upon the principle of balance, the law of increasing and decreasing returns, and the proper apportionment of the four agents in production. The value of a property depends on the balance of these four, which are:

1. Labor (wages)
2. Capital (the investment in buildings and equipment)
3. Coordination (management or entrepreneurial contribution)
4. Land.

Maximum value, therefore, is achieved when the agents in production are in economic balance. There is a theoretical point

of balance in each property which will produce the greatest net return. An imbalance exists when a building represents an underimprovement or overimprovement of its site. It is present also when the cost and amount of special services to the tenants are too little or too much as related to the character of the building and its rent schedule. These conditions illustrate the principle of balance, affirming that disadvantage or loss in value attends any excess or deficiency in the contribution of the four productive agents.

Goods and services resulting from the use of these agents produce gross income. Labor has the first claim on gross income. The costs of capital are next. These costs include interest on, and amortization of, funds invested in the buildings, equipment, and furnishings. The source of these funds will shrink and eventually disappear if the costs of capital are not paid. The costs of coordination have the third claim.

In classical economic theory, land has the last claim on gross income. Any income remaining after labor, capital, and coordination have been satisfied can be credited to the land for its contribution to gross income.

In appraisal practice, recovery of all or part of the capital invested in land is not provided as an allowance set aside for that purpose, such as a depletion allowance in mineral and forest lands. As will be developed in succeeding chapters, any uncertainty concerning the future value of the land is reflected in the rate of return necessary to attract an investor. For example, an investor might consider 12% to be a reasonable rate of return for land with a somewhat uncertain outlook, but he might consider a 7% rate sufficient if the land were in a well stabilized neighborhood.

The principle of balance is applied in the process of estimating highest and best use in appraisal practice. Thus the proper apportionment of the agents in production is essential if maximum net return is to be produced and maximum land value developed. Because land has last claim on the gross income produced by the

proper apportionment of the four agents, the land value is residual. The land residual technique utilizing the principle of balance is used to estimate land value, as presented in later chapters on site valuation and capitalization.

Balance is vital to effective business operations. The number of services and agencies which can be supported by a population of a stated size obviously is limited. When there are too many drug stores in a community, for example, either some will be successful at the expense of the others, or none will yield an adequate return on its investment. The law of balance affirms that value is created and maintained in proportion to the equilibrium attained in the amount, character, and location of essential uses of the real estate.

Conformity

The principle of conformity holds that maximum value is realized when a reasonable degree of sociological and economic homogeneity is present. Thus conformity in use is usually a highly desirable feature of real property since it creates and maintains value; and it is maximum value which affords the owner a maximum return. Reasonable homogeneity in the principle of conformity implies reasonable similarity; it does not mean monotonous uniformity. Generally, the most satisfactory use of land is realized when it conforms to the standards governing the area in which it is located.

The elements of conformity are not preconceived standards of development, but have evolved as cities grew and land uses multiplied. Homeowners recognized the advantages of living in neighborhoods designed and developed to provide facilities or amenities which added to the benefits of ownership, and they protected those assets by maintaining conformity through zoning.

After World War II, leaders of industry discovered the advantages of locating in exclusively industrial areas or parks designed and developed to provide industry's required facilities. Many industrial parks further restrict occupancy to either light or heavy industry.

Harmony or conformity of use is also apparent in the grouping of stores in certain retail districts. Generally, merchants realize the most satisfactory volumes if their stores are located in close proximity to those of other merchants who sell the same type and quality of merchandise. In many areas, zoning protects retail locations from non-retail commercial uses. Therefore, conformity is one of many important factors considered in the selection of a store site.

Certain other phenomena resulting from lack of conformity may be observed. For example, an overimprovement or underimprovement reflects lack of conformity between a property and its environment; misplaced improvement is a violation of the principle of conformity; the value of an overimprovement sometimes declines (regresses) toward the value level of the conforming properties; and conversely an underimprovement tends to affect adversely the value level of adjacent and otherwise conforming properties.

Supply and Demand

The principle of supply and demand involves the interrelationship of economic forces affecting market value. There is a point at which supply and demand are, at least theoretically, in balance. At this point market value tends to reflect cost of production or replacement. Increasing supply or declining demand tend to affect adversely the price obtainable in the market. The opposite is similarly true although the relationship may not be directly proportional in either case, owing to corollary considerations in a specific situation.

Demand for a commodity is created by its usefulness and affected by scarcity. Demand is unlimited in the social sense; that it, there is no limit to the things people desire—from a cottage to a castle in Spain. But effective demand is limited in the economic sense by the financial ability of people to satisfy their desires. For example, many people share a longing for expensive things, which they are financially unable to buy. The strongest desire is ineffective unless it is accompanied by the

buying power to gratify it. Although this inability to satisfy desire does not reduce the intensity of that desire, it does affect the intensity of the demand for an object. Because demand is influenced by desire, the forces which arouse, intensify, or create desire also affect demand. Two major creative forces are education and advertising. Without knowledge that an object exists, people cannot desire it, and there would be no demand for it.

Land scarcity is a shortage in the amount of land available in a stated area for a specific use. It is obvious that the greater the scarcity of land desired and available for a specific purpose, the greater is the economic desirability of that land. This is shown by historically increasing land values in the central business districts of rapidly growing cities. Usually cities are surrounded by land—not available, due to location, for convenient and profitable use. Thus, value is influenced by land scarcity in relation to its utility.

Technological and zoning changes, particularly with reference to some types of commercial property, often have the effect of increasing land area by adding floor levels to buildings. Faster elevators, improved communications and security facilities, and higher ratios of net rentable area may give land increased utility, and resulting value, by enabling more square footage of usable floor area to be loaded on each square foot of ground. These higher ratios result not only from advanced architectural design, but also from improvement in construction materials and their handling.

Among the factors affecting supply or demand for real property are population changes, purchasing power, price levels, wage rates, taxation, building codes, and government controls. The supply of housing, for example, is controlled in part by rentals and sale prices; that is, it is increased or decreased according to whether these rentals and sale prices conform to the temper of the market. A certain combination of factors must be present in the housing market to stimulate additions to the housing supply. This occurs when simultaneously there is a shortage in the supply of housing

units, a strong demand for housing, and an effective purchasing power to satisfy the demand at the rentals and prices offered. But those rentals and sale prices must be high enough to encourage builders to construct new units. If demand is very strong and purchasing power is increasing faster than the ability of the supply to satisfy it, the rentals and sale prices for units available will rise. When increased rentals or prices continue to find a ready market, more builders enter the market, thus accelerating the pace at which additions to the supply are made.

Other factors influence the real estate market beside the prices and rentals offered. Scarcity of labor, accompanied by high wage rates, can affect the supply by increasing its cost beyond the purchasing power of the market, thus discouraging builders from adding to the supply. Taxation by increasing the cost of home ownership, apartment or commercial rental above the means of owner or tenant can affect the supply by restricting demand. Rent control, the tightening of money, zoning, and other governmental regulations influence supply and demand by imposing limitations.

Highest and Best Use

Fundamental to the concept of value is the theory of highest, best, and most profitable use. Highest and best use is that which, at the time of appraisal, is the most profitable likely use of a property. It may also be defined as that available use and program of future utilization which produces the highest present land value. It is important to observe that the most profitable likely use cannot always be interpreted strictly in terms of money. Net return sometimes takes the form of amenities. A wooded urban site, for example, may have its highest and best use as a public park; or the amenities of living in a private dwelling may represent to its owner a net return which outweighs a monetary net rental yield available from rental to a typical tenant.

It has been stated that land has no value until man can use it, but that the amount of the value depends on the character of the intended use. Because the owner of real estate wishes to reap

the greatest possible return from his property, ordinarily he will select that use which will achieve this objective. Since change is ever present, the existing use of land may no longer conform to what has become its highest and best use or uses. For example, in the central business districts of most large cities there are parcels of land devoted to parking lots. In an area usually characterized by scarcity of land and a high use-density, utilization as a parking lot would seem to be the antithesis of highest and best use. Consideration of all factors involved may indicate that such use is, in fact, a most profitable interim use at the time because the supply of land already being devoted to the uses characteristically found in central business districts, in this case, exceeds that needed to satisfy current demand.

Many examples can be found of tall buildings being razed and their sites developed as parking lots or with single or two-story structures. At the time the change in use was made, the net return to the land from the proposed new use would be higher than had existed under the former use. Hence the value of the improvements is inextricably related to the principle of contribution, inasmuch as existing improvements are tied to the land, and their value will rise or fall accordingly.

Consistent use is basic to highest and best use. A property in transition to another use cannot be valued on the basis of one use for land and another for improvements. This would be inconsistent with the economics of valuation. Improvements must add to the value of the land, in order to have value attributed to them. A building which may have many years of remaining life may not enhance the value of the land which has a higher use, except as an interim-use taxpayer while the land itself is in transition. Following the concept of appraising the land as though vacant for immediate use, the improvements may have no value. In fact, they may represent a burden to land value to the extent of the cost of their removal. Where the transition to highest and best use is deferred, the element of interim use should be considered. The improvements would be judged on the basis of only tempo-

rary enhancement of site value, measured by comparable market data and by consideration of the net income produced for the interim period.

In most communities land is zoned for specific uses. Such zoning may not conform to current market requirements and thus the land either lies idle or is not developed to its highest or best use. It will probably remain economically fallow until the prescribed limitations are lifted. Other factors such as deed restrictions may have the same effect.

Under the law of eminent domain, in most jurisdictions, admissible value evidence requires the appraiser to consider a property's highest and best use, in formulating his opinion of its market value. In most takings, the highest and best uses customarily are the ones physically feasible and permitted by zoning ordinances or private restrictions. If the land manifests more valuable use potential than allowed by law, and if there is a reasonable probability that a change in its use will be permitted, this affects its value to the extent that a buyer or a seller might recognize this potential in price, after giving due consideration to time and expense factors involved in the change.

Summary

The concepts discussed in this chapter have been treated separately, but with a recognition of the relationship and interdependence between them. For example, demand creates profits; profits arouse competition; competition adds to the supply; additional supply decreases profits; decreased profit weakens demand; weakened demand reduces the supply. These forces and factors are related in a cyclical cause-and-effect movement. This is a broad generalization; in actual experience other factors could modify the pattern at different intervals or points in the cycle. Familiarity with each of these concepts and their relationships assist an appraiser in his study of real property.

While the fundamental economic principles discussed in the chapter form a basic background for real estate valuation, their

practical application in appraisal practice necessitates the use of various techniques. Selected techniques are applicable to specific properties in a well-recognized market and subject to manifold financial arrangements. Economic connotations are frequently identified by appraisal terminology and sometimes in terms relating to accounting and financial usages.

In brief, the concepts discussed in this chapter are:

ANTICIPATION

1. The principle of anticipation affirms the definition that value is the present worth of the rights to all prospective future benefits accruing to ownership and use of real property.
2. Recent sale prices of comparable properties indicate the market value of such rights and benefits.

SUBSTITUTION

1. The value of a replaceable property tends to be indicated by the value of an equally desirable substitute property.
2. The value of a property tends to coincide with the value indicated by the actions of informed buyers in the market for comparable properties.

CHANGE

1. Change is constantly occurring.
2. Cities, neighborhoods, and individual properties undergo the process of change.
3. The effect of prospective changes is reflected in the market.
4. Change is fundamentally the law of cause and effect.

COMPETITION

1. Competition is a product of supply and demand.
2. Competition arises from profits; profits create competition.
3. Excess profit breeds ruinous competition.
4. Profit denotes an excess or surplus over and above satisfactory returns to labor, capital, coordination, and land.
5. Competition tends to dissipate the major portion of excess profit, although some part may remain and contribute to increased land value.
6. A certain portion of profit may be temporary; therefore it is not capitalized in the estimate of the value of land. For its duration, it is treated as a short-term annuity.
7. The value of land is dependent on the use which yields the best return.

INCREASING AND DECREASING RETURNS

1. The application of larger and larger amounts of the agents in production will produce greater and greater net income (increasing returns) up to a point (surplus productivity).
2. The point of maximum contribution of agents in production (point of decreasing returns) attests to the proper combination of agents resulting in highest and best use.
3. Any further increase in the amount of agents in production will decrease the margin between cost of agents and gross income they will produce, resulting in decreased net income returns.
4. The principle of decreasing and increasing returns applied to a proper improvement of the land indicates its highest and best use.

CONTRIBUTION

1. The principle of contribution is the principle of increasing and decreasing returns applied to a portion or the whole of an improvement.
2. The value of an item in production is measured by its contribution to the net return of the enterprise.
3. Application of this principle is basic to any feasibility study or remodeling or modernization program, and in the valuation of lots of varying depths.

SURPLUS PRODUCTIVITY AND BALANCE

1. The value of a property depends on the balance of the four agents in production: labor, capital, coordination, and land.
2. Surplus productivity is defined as the net income (often imputable to land) remaining after the costs of labor, capital, and coordination have been paid.
3. Land has the last claim on the surplus productivity of the agents in production.
4. Disadvantage attends any excess or deficiency in the supply of the agents in production.
5. Equilibrium (balance) in character, amount, and location of essential uses of real estate creates and maintains value.
6. The principle of contribution is related to surplus productivity in that the value of an individual agent in production depends upon how much it adds to, or detracts from, the income because of its presence.

CONFORMITY

1. Conformity is the result of a reasonable degree of architectural, social, and economic homogeneity.

2. The highest and best use is generally realized under circumstances of conformity.
3. The principal purpose of zoning regulations and private restrictions is to maintain conformity.

SUPPLY AND DEMAND

1. Utility creates demand, which is desire for possession.
2. Demand is effective when supported by purchasing power.
3. Value is increased if supply is reduced by effective demand, resulting in scarcity.

HIGHEST AND BEST USE

1. Highest and best use is that which, at the time of appraisal, is the most profitable likely use of a property. It may also be defined as that available use and program of future utilization which produces the highest present land value.
2. Existing use may or may not conform to highest and best use.
3. Highest and best use may comprise a combination of a profitable interim (transitional) use and a deferred, more profitable potential use.
4. Highest and best use may be limited by zoning or deed restriction.
5. Improvements must add to the value of the land in order to have value attributed to them.
6. The principle of increasing and decreasing returns affirms the proper apportionment of land and improvements to achieve maximum land value.
7. Balance and consistent use are important collateral considerations in the selection of highest and best use.

CHAPTER FOUR

The Appraisal Process

To make an appraisal is to solve a problem. The solution requires interpretation, in terms of money, of the influences of economic, sociological, physical, and governmental forces on a specific real property. The finished product provides the basis for a decision relating to the property being appraised.

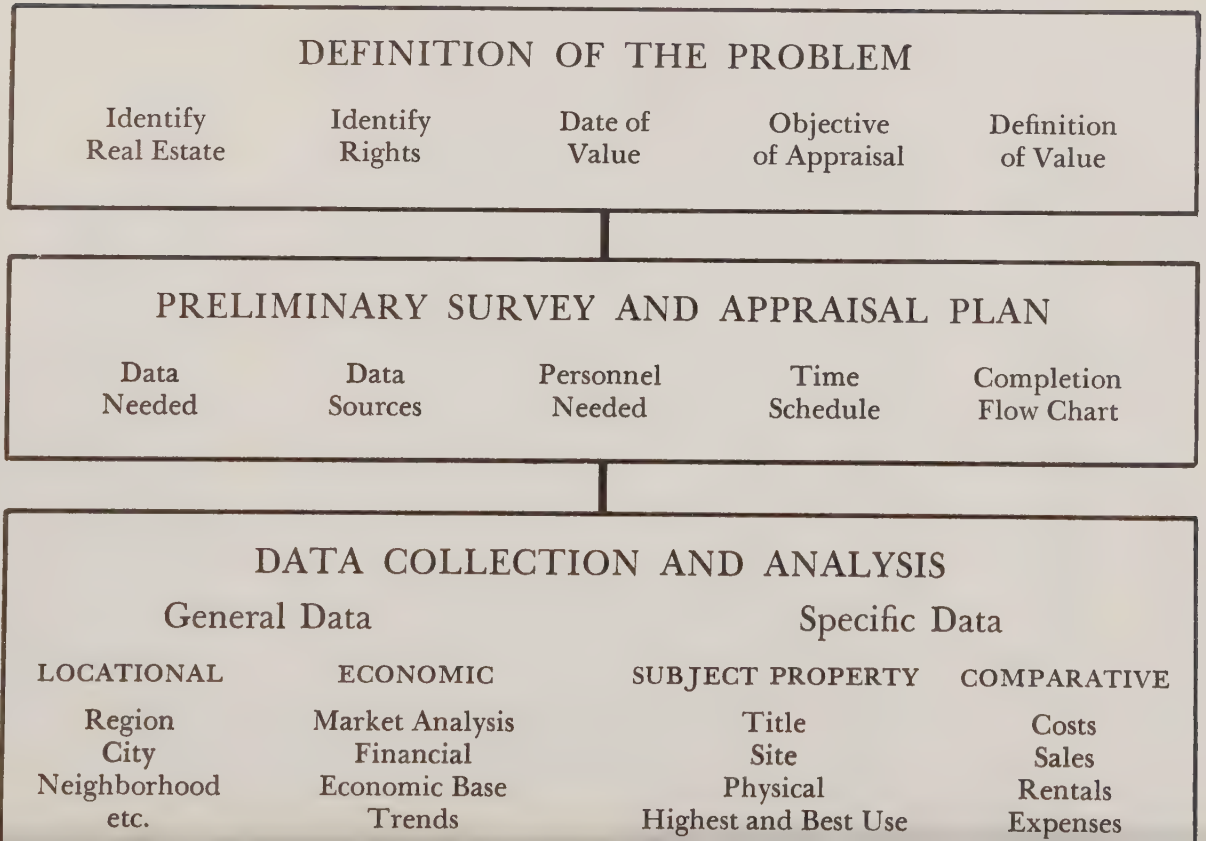
Characteristics of real property differ widely. This does not mean, however, that there is wide variation in the orderly procedure for solving the appraisal problem. The best experience in the appraisal field is crystallized in the *appraisal process.* This process is an orderly program by which the problem is defined; the work necessary to solve the problem is planned; and the data involved is acquired, classified, analyzed, interpreted, and translated into an estimate of value. The appraisal process is a concise, logical way of making a thorough, accurate appraisal in an efficient manner. It also can serve as the outline of the appraisal report. The step-by-step procedure of the appraisal is illustrated in the diagram, the Appraisal Process.

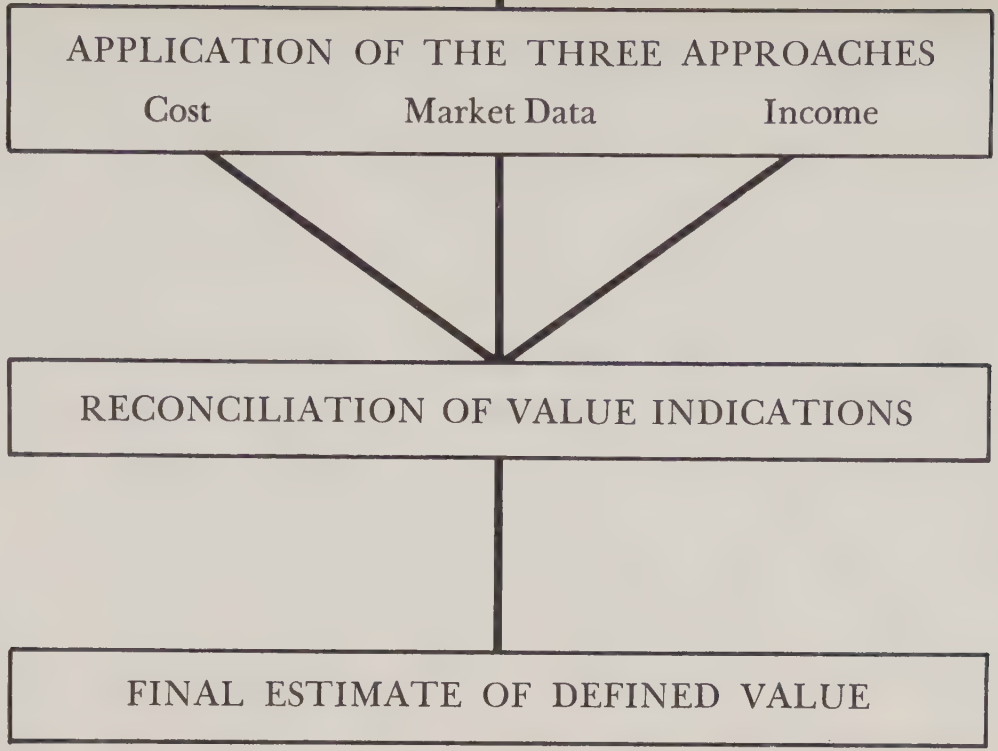
Definition of the Problem

The first step in the appraisal process is to develop a concise statement of the problem, thus eliminating any ambiguity about the objective of the report. To understand the precise nature of this process, five basic factors are identified:

1. The real estate to be appraised
2. The property rights involved
3. The date as of which the estimate applies

THE APPRAISAL PROCESS




APPLICATION OF THE THREE APPROACHES
Cost
Market Data
Income
RECONCILIATION OF VALUE INDICATIONS
FINAL ESTIMATE OF DEFINED VALUE

4. The objective of the report
5. The defined value to be estimated.

Identification of Real Estate

A property is first identified physically by means of a mailing address or other descriptive data, which enables anyone to locate the property or to refer to it by recognized landmarks. The property might be identified, for example, as follows:

> 132 South Ninth Street, Central City, State of Ohio, fronting 100 feet on the west side of the street, 50 feet north of Main Boulevard. The site is 150 feet deep, improved with a two-story and basement retail building.

More precise identification is provided by a legal description. This description can be obtained from the existing deed, from a title policy, from the public records, from an existing mortgage, or from an accredited survey. After the legal description has been obtained, it can be checked carefully in order to make certain that it describes accurately the precise property to which it is intended to apply. Whether a complete legal description is included in the body of an appraisal report is a matter of judgment in each case. A lengthy legal description may be made part of the appraisal addenda.

Legal descriptions of real estate are basically derived from land surveys and are preserved in public records in accordance with laws applying in the area where the property is located. Land surveying is a highly technical procedure. The appraiser need not be a surveyor, but he should be familiar with the specific system or systems commonly employed in his area. Several systems of legal description are in use, including:

Government survey
Lot and block
Metes and bounds
Geodetic survey, prepared by the United States Geological Survey, Department of the Interior.

Details of these are given in the chapter on Site Analysis.

Identification of Property Rights

The second factor in defining the appraisal problem is the determination of the property rights to be appraised. A real property appraisal is not solely a valuation of the physical land and improvements. It includes a valuation of the rights which one or more individuals may have in the ownership and/or use of the land and improvements. An appraisal of all of the private rights usually attached to a specific real property may be desired; or the appraisal of only limited rights in the property may be required. Partial or fractional interests may be divisions of the benefit accruing from the use of the entire property through partnership interests in fee ownership or through land trusts or corporation stock. They may also be contractual interests including, among others, fee, leasehold, easement, and use restrictions. Ownership of a property may be held by an individual, a partnership, a corporation, or a group of heirs. When ownership is vested in more than one interest, each may hold an equal or unequal share.

The property rights or interests to be appraised may be the value of rents to be received plus a reversionary right at the end of a lease term. It may be a reversionary right which becomes effective upon the death of a designated individual. It may be the air rights over a specified area, or it may be designated subsurface rights. It may be the value of a tenant's interest in an existing lease. It may be an easement, a right of way, or a fee subject to an easement. Because the value of real property is not limited to the physical land and the improvements, the appraiser cannot define the problem precisely until he knows exactly what property rights may be involved. Without this information his work may produce an estimate of value which is irrelevant to the problem.

Therefore, the appraiser ascertains at the outset exactly which rights he is to value. This knowledge permits him to understand the character and complexity of the appraisal assignment and to estimate more accurately the extent of research required, the amount of time necessary to accomplish the assignment, whether

additional specialized personnel will be needed, and probable costs. For example, the appraisal of the fee simple interest held by one person in a ranch may be an uncomplicated assignment; but if it involves the valuation of mineral deposits held by a lessee under a 15-year lease of the subsurface rights of a property, it could become complicated and might require an engineer's counsel. The subject of partial interests is more fully covered in a later chapter, the Valuation of Partial Interests.

Date of Value Estimate

The third factor in defining the problem is the date as of which the value estimate applies. The specific date is important because the factors which increase or decrease value are always in the process of change, causing the value of real property to fluctuate. Thus an opinion of value is valid only for that point in time for which it is formulated. Usually an appraisal assignment involves a current value estimate. The character of the data and the time and effort involved usually follow a familiar pattern. They concern conditions which the appraiser can observe all about him. They deal with conditions as they are.

In many cases, however, an appraisal is required as of some date in the past. Such valuations may require retrospective valuations as of dates varying from months to years earlier. Retrospective appraisals may be required for inheritance tax (date of death), insurance claims (date of casualty), or federal income tax. Concerning taxes, it has frequently been necessary to establish value of a property as of March 1, 1913, the date of the inception of the federal income tax, in order to establish the capital gain on property owned since that date. Another example is valuation of Indian treaty lands. Practically the entire area of the continental United States has for years been the subject of suits by the various Indian tribes who conveyed their lands to the United States by treaty for a consideration. This has required retrospective appraisals as of dates from the time of the Revolutionary War through most of the 20th century.

In condemnation appraising, depending upon local legal pro-

cedure, the appraiser may be required to make a market value estimate either as of the date upon which the petition to condemn was filed, or as of the trial date.

Objective of the Appraisal

The fourth factor in defining the problem is to develop a clear understanding of the objective of the report. Basically, an appraisal is an answer to a question. Such a question may be simple: What is the market value of the property? What is the rental value of the property? For what amount should the improvements be insured? The questions, however, may become much more involved and sophisticated. The appraiser may answer any question that his client presents, provided that the entire question asked by the client, with the conclusion, is clearly stated in the appraisal report, whether presented verbally or in writing.

An appraisal is the basis for a decision concerning real property. The nature of the decision affects the character and direction of the report. The purpose of an appraisal is to estimate a value, but the definition of the value sought dictates the type and character of data to be gathered, the methods to be employed, the factors likely to wield the most influence, and the type of report required. As indicated in the discussion of the rights involved, the uses for which an appraisal may be needed vary. The arrangement of the report and the data which is given the most weight in formulating the final estimate of value reflect the objective of the report, the specific questions which the appraisal is to answer. Therefore, in defining the problem, the appraiser usually develops an understanding of this objective, clearly acceptable to both his client and himself. This avoids misunderstanding and misdirected effort.

Definition of Value

The fifth major factor defining the problem is the definition of the value to be estimated. It has been previously pointed out that an appraisal is an answer directed to a specific question. Whereas a property has only one market value as of a given date,

there are occasions when other types of value are sought. If the value estimate is to be based upon a special set or alternate sets of circumstances, these assumptions should be stated with the definition of value.

Although market value is sought in most appraisal assignments, this may not be the answer sought in all instances. If the owners of an industrial concern require an appraisal of their plant for negotiating a merger or for the sale of a partial interest, a value in use, reflecting any lack of functional utility, may be the appropriate value concept. However, if the same owners wish to sell the property and seek an opinion of its market value, many of the highly specialized features of the plant which are necessary to the owners' operation may have little, if any, value to another user. In fact, some features could be liabilities in adapting the property to another type of industrial operation. The estimate of its market value will reflect the price expected if the property were offered in the market for a reasonable period.

The possibility that uninformed people may not understand the exact meaning of terms commonly used by appraisers is another reason for including a written definition of value in the appraisal report. An exact definition of the value sought delineates the question to be answered for both client and appraiser. It explains the choice of data considered and the methods used to process that data, thus supporting the logic and validity of the final value estimate.

Preliminary Survey and Appraisal Plan

The appraiser's survey of the basic problem leads to a definite plan for developing his report. This usually involves an outline of the proposed contents, indicating the main divisions or sections of the report and the data and processes pertinent to each. Such an outline permits intelligent and orderly assemblage of data and the judicious allocation of time to the steps involved. It also indicates the subject classifications for his plan of work. After deciding on the type and scope of the data to be assembled, the appraiser is ready to consider the problem of its availability.

Selection of the appraisal approaches which develop the most rational value indication also affects the type of data to be assembled. As the majority of assignments involve an estimate of market value, the market data approach is basic to most appraisal value estimates. Nevertheless, in nearly all appraisals, application of all three approaches is fundamental. This means that cost data and income data also should be developed except when application of one or both of these approaches is not pertinent or is impractical.

The selection of the dominant approach may depend on the question to which the client seeks an answer. An appraisal to estimate the value of a property for insurance purposes might require emphasis on the cost approach. The most relevant consideration in the appraisal of a property taken by condemnation is market value, as indicated by the application of the market data approach which may be supplemented by the cost and income approaches. The income approach—using comparable income data from the market—is particularly indicative in the appraisal of income-producing investment-type properties. An opinion based primarily on a value indication derived from use of the cost approach is seldom acceptable, except where the type of property is so specialized that it is not customarily traded in the market.

Data Needed

Once the problem is defined in terms of the five essential steps given above, the appraiser is ready to make a preliminary survey. The purpose of this survey is to estimate the character, the scope, and the amount of work necessary to solve the problem. These depend largely upon the type of property being appraised; e.g., a great deal more information is required in the appraisal of a large motor-hotel than a residence.

Data Sources

Some data sources are used in practically every appraisal, and others are used only occasionally or for specific types of improvements. Data pertinent to the appraisal of a hospital differs from

data assembled in support of a truck terminal, theater, or bowling alley. Whereas the appraisal of such special purpose or single-use properties may involve specific areas of research, there are several customary sources of essential data in a community with which the appraiser is familiar and which he consistently employs. These may be considered in a basic division into public and private categories.

Public Records. A major source of title information is legally on record in the courthouse or hall of records. Some recording systems are well classified and maintained, so that a title check can be made with greater reliance on the accuracy of the records and with the minimum expenditure of time and effort. The city and county offices are the customary sources of information about zoning, traffic regulations, water and sewer lines, and public health and welfare regulations. Information about transfers, leases, and assessed values is published and sold in some cities.

In the course of his practice, it is possible for the appraiser to compile a large volume of general data, particularly concerning the city, region, and the neighborhoods in which he operates. When data of this character is pertinent in numerous assignments, a permanent filing system and an office procedure for its maintenance may be established for convenient reference.

Private Sources. Data pertinent to the physical cost analysis of buildings may also be found in the cost manuals published by several reputable organizations. These manuals usually can be purchased separately or as a part of a continuing service providing current data at regular intervals. Local cost indices are published in the larger cities. The appraiser may also maintain in his files data on the local cost of construction materials, labor wage scales, and copies of contractors' cost breakdowns for specific structures. Multiple listing systems, real estate brokers' records, classified advertising, and newspaper items are additional sources of information.

Data personally compiled by the appraiser gradually accumulates into what is called an appraisal plant or library. The ac-

cumulation of general and specific property data, classified by location and type of property, makes the data plant progressively more useful. This data plant may also include various publications devoted to appraising and to related business and industrial fields as well as those in which building materials, costs, and trend information are reported.

In the preparation of a specific report, appraisal plant data is usually augmented by current research. The appraiser may extend his investigations to include other appraisers, real estate brokers active in a particular market, mortgage lenders, data banks or similar services, all in addition to the public or private record sources noted above. A great deal of specific as well as general data is available from the local chamber of commerce offices, newspaper publishers, title companies or abstract offices, and utility companies.

Personnel and Time Requirements

Orderly planning and scheduling of all steps in the preparation of an appraisal result in an efficient application of the time and effort necessary to complete the assignment.

At the same time, outside assistance may be engaged when it is desirable to augment a report by the professional opinion of an expert in some specific area. This might consist of an engineering opinion concerning such things, for example, as soil bearing, structural or functional considerations.

The appraiser's ability to recognize the areas in which he can delegate detail assures him time to do things that only he can do, and leaves his mind free to make the important decisions.

Scope of Work. Time and personnel needed for any particular assignment vary with the amount and complexity of the work entailed. In some cases this may involve a matter of days. In a more complex situation, it may take weeks or months to amass and process all pertinent data and require the services of other professional assistants to supplement the appraiser's staff. In the latter type of assignment, for example, the fee should be arrived

at after consideration of the probable time to be spent by the appraiser and his assistants in research, office and field work, and conferences. It should also cover any consultation fees which the appraiser may incur for engineering, architectural, and other specialized services, in addition to the cost of overhead, travel, and clerical or stenographic help.

Work Schedule. A planned schedule of work to be performed may be helpful, particularly for larger, more complicated assignments. Sound working habits for both the appraiser and his assistants, combined with a clear and definite understanding of the exact nature of the work to be done by each person, also help to expedite efficient handling of an assignment. As the over-all responsibility is the appraiser's, he should be able to see the assignment both totally and in detail, to recognize the nature and volume of work entailed, and to schedule and delegate the work to take full advantage of staff capabilities. A completion flow chart often helps to make the work systematic.

Fee Proposal

An appraiser may be asked to quote a firm fee in advance of receiving a commitment to proceed with an assignment. The fee may be either on a per-hour or per-day basis, or it may be an over-all amount. The appraiser's experience and familiarity with his cost of operation permits him to establish a base figure to cover the actual cost of his typical assignments. This requires consideration of the extent of research and personnel needed and the time and work schedules for completion of the report, resulting from his earlier steps, according to his preliminary survey and appraisal plan. He adjusts this figure to include his estimate of any additional and unusual expense required by the individual assignment. To this subtotal he adds another figure representing the remuneration for his own contribution. The total is the fee quoted to the client. Also taken into consideration in arriving at this total is the importance of the assignment with attendant responsibility.

The amount which any particular appraiser may command for his services varies, depending on his experience and ability in specific areas, his judgment, and the degree to which clients believe they may rely on his conclusions. His reputation for possessing these qualities is usually the reason his services are sought. In this regard, the real estate appraisal profession is no different from any other. The appraisal report itself is only paper, but with the appraiser's signature, it acquires tangible value in proportion to his reputation for professional competence, judgment, and integrity.

Form of Proposal. The appraiser's proposal to a client may be oral or in writing, and should cover his understanding of the problem including:

1. Identification of the property
2. Statement of rights to be appraised
3. Date as of which the estimate is desired, and date on which the appraisal report is to be delivered
4. Question to be answered by the appraisal
5. Definition of the value to be sought
6. Form of report and number of copies required
7. Quotation of the fee, either specifically or within a range
8. Understanding concerning responsibility and compensation for any other services, such as testimony or recertification of the value after completion of proposed construction.

The client's acknowledgement that he understands and approves the conditions may be indicated by nothing more formal than his signature on a copy of the letter. Such a commitment from the client is evidence that client and appraiser agree on the nature of the problem. It also promotes harmonious relations between client and appraiser, and avoids misunderstandings when the report is delivered.

Data Collection and Analysis

The important and guiding principle in the collection and analysis of data in connection with any specific appraisal assignment is that it should have a bearing on the value of the property

being appraised and the appraiser's conclusion. Data should not be included in a report without some analysis pointing out its general or specific impact upon the valuation conclusion. Appraisal data which is pertinent in a specific assignment may be divided into two classes, general and specific.

General Data

General data relates to the economic background, the region, city, and the neighborhood; that is, all elements outside the property which influence its value and reflect the action of the four forces affecting value.

Regional and city data include population characteristics and trends, price levels, levels of employment, and other factors as discussed in more detail in the chapter on Economic Trends. Neighborhood data is less broad than city or regional data because it involves factors pertaining to a smaller area. It should include information concerning typical land uses, zoning controls, public utilities, transportation facilities, schools, shopping facilities, and other amenities, plus a discussion of the character and quality of the properties which comprise the neighborhood.

Economic Data

This includes facts concerning the current economic environment—the interest-rate levels and trends, population and purchasing power, construction cost with expense levels and trends. The nature and relevance of this data is also discussed in Economic Trends as well as in other chapters.

Specific (Subject Property) Data

Specific data concerns the property being appraised, and is also substantially applicable to sale properties in the market data approach. It includes information about the title, the building, and the site. Pertinent data may include identity of ownership, type of ownership (warranty deed or other), existing easements and encroachments, zoning regulations, assessed value and taxes, and

deed or other restrictions. Building data includes a complete description of the physical improvement; its condition; and an analysis of its layout, style, and design. Information about the site includes a description of the land (size, shape, topographical features) and public improvements (paving, walks, curbs, water, sewers, gas, electricity). Additional data for consideration may pertain to such factors as corner influence, building orientation, advertising value, or accessibility of the site, depending upon the type of property and the problem to be solved. Site data in an appraisal of an industrial or commercial property, for example, may include considerations which are irrelevant to a single-family home site.

The final step in the analysis of specific data is to ascertain the highest and best use of the site. The work done in this step may constitute the background for later consideration of market value. Often the highest and best use of a site is its existing use, which may conform to the use permitted under the current zoning regulations. However, the appraiser may find evidence that the existing use does not constitute the highest and best, that a higher use is permitted within current zoning restrictions, or that a change in zoning represents a reasonable expectancy which would be recognized by an informed purchaser. Such a factual finding may have great importance in arriving at the final estimate of defined value.

Specific (Comparative) Data

This includes data on sale prices and rentals of properties that are reasonably comparable with the property to be appraised. As the purpose of analyzing these sales is to obtain an indication of the amount for which the property under appraisal would sell if offered on the market, such sales should ideally be sales of identical parcels. However, as no two properties are identical, it is necessary to accept available sales of reasonable comparability and to make adjustments reflecting the probable differences in their market value. The subject of comparable sales and the

treatment of market data is more fully discussed elsewhere in this volume.*

The total process of data collection and analysis represents the foundation for a sound appraisal report. Moreover the conclusion can be no better than the reliability of the data considered or the competence of the analysis and reasoning applied to it. At this point the background has been completed for development of each of the three approaches to the final estimate of defined value.

Application of the Three Approaches

The three approaches—cost, market data, and income—are based on these three facets of value:

1. The current cost of reproducing a property less loss in value from deterioration and functional and economic obsolescence (accrued depreciation)
2. The value indicated by recent sales of comparable properties in the market
3. The investment value that the property's net earning power will support, based upon a capitalization of net income.

In his assignments, the appraiser considers all three approaches. For a particular property or type of property, the value indication from one approach (or two) may be most significant; yet, when possible, he uses all three to check against each other. There are appraisal problems in which all three approaches cannot be applied. For example, the cost approach is impractical in the valuation of vacant land; the market data approach is similarly inapplicable for specialized property, such as a garbage disposal plant; and only rarely is the income approach helpful in the valuation of an owner-occupied home. All three approaches are, however, pertinent to the solution of many appraisal problems. Their use is well established in appraisal practice, and accepted as part of the fundamental procedure.

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* See Index.

Cost Approach

In the cost approach,† the appraiser obtains a preliminary indication of value by first estimating the value of the land and adding to this his estimate of the depreciated reproduction cost of the building and other improvements.

To obtain financing for a proposed development, a valuation of the land and the projected improvements is essential. Such an appraisal requires an estimation of the probable cost of the improvements from a set of plans, to which is added the value of the site. The cost approach also plays an important part in the effort to determine highest and best use based upon cost estimates for hypothetical improvements.

The cost approach may be considered in five steps:

1. The estimate of the *land value* as if vacant
2. The estimate of the current *cost of reproducing* or *replacing* the existing improvements
3. The estimate of accrued depreciation from all causes
4. Deduction of accrued depreciation estimate to arrive at indicated value of improvements
5. The addition of the land value to the indicated value of the improvements to develop indicated property value.

In the cost approach, the value of the land usually is estimated either on the basis of the market data approach (sales of comparable sites) or the land residual technique in the income approach (based on potential earning power). These and other techniques are discussed in the chapter on Site Valuation.

Reproduction Cost New. The cost approach is based on the assumption that the reproduction cost *new* normally sets the upper limit of value, provided that the improvement represents the highest and best use, and is not subject to substantial functional or economic depreciation. It is also assumed that a newly constructed building has advantages over an existing building. The first step in analyzing the improvements, therefore, is the

† See chapter on the Cost Approach.

development of their estimated *reproduction,* or *replacement,* cost new. Methods of deriving this figure are discussed in the chapter on Building Cost Estimates, where the difference between these two terms is explained.

Depreciation. The appraiser next considers the effect upon value of any disadvantages or deficiencies of the existing building as compared with a new building. The measure of this deficiency is called depreciation.

Depreciation‡ may be one or all of three kinds:

1. Deterioration, or the physical wearing out of the property
2. Functional obsolescence, or a lack of desirability in layout, style, and design as compared with that of a new property designed to serve the same function
3. Economic obsolescence related to a loss of value from environmental causes.

Cost Estimating Methods. Obtaining reliable construction cost figures upon which to base the estimated reproduction cost is one of the practical problems encountered in applying the cost approach. The quantity survey method (detailed cost estimates of labor and materials) is the comprehensive method of estimating reproduction cost. This is comparable to an engineering report with estimated individual costs supported by detailed cost estimates. As such a report entails considerable time and money, the decision to compile it depends on the significance of the cost approach in the appraisal. In most appraisals a highly detailed estimate of reproduction cost is not necessary. A reasonable estimate of reproduction cost obtained by applying square-foot or cubic-foot reproduction cost units to the area or volume of the building usually is sufficient.§

Limitations. A well-developed cost approach is basic to the understanding and solution of most appraisal problems, but its applicability and importance may vary widely among individual cases. The cost approach value estimate is valid if the land value

‡ See chapter on Depreciation.
§ See chapter on Building Cost Estimates.

estimate is sound, if the reproduction cost has been estimated accurately, and if the estimate of depreciation from all causes is correct. But physical deterioration and functional and economic obsolescence cannot be measured as precisely as a physical object. Its measurement—or better, its estimation—depends largely on the experience and judgment of the estimator. Therefore, a final estimate of value, based solely on reproduction cost less depreciation plus the value of the land, may be subject to serious limitations. Wherever possible, it should be supported by an analysis of functional utility, and reconciled with the market data and income approaches.

Market Data Approach

The market data approach* is essential to almost every appraisal of real property. The value estimated by this approach is variously defined in the chapter on the Nature of Real Property and Value. These definitions are essentially based on the threefold assumption that there is a market for a particular property, that both buyer and seller are fully informed as to the property and state of the market for that type of property, and that the property would be exposed in the open market for a reasonable time period.

In applying the market data approach the appraiser does five things:

1. Seeks out similar properties for which pertinent sales, listings, offerings, and/or rental data are available.
2. Ascertains the nature of the conditions of sale, including the price, terms, motivating forces, and its bona fide nature.
3. Analyzes each of the comparable properties' important attributes with the corresponding ones of the property being appraised, under the general divisions of time, location, and other characteristics, including physical and economic.
4. Considers the dissimilarities in the characteristics disclosed in Step 3, in terms of their probable effect on the sale price.

* See chapters on Principles of the Market Data Approach and Application of the Market Data Approach.

5. Formulates, in the light of the comparisons thus made, an opinion of the relative value of the subject property as a whole or, where appropriate, by applicable units, compared with each of the similar properties.

The application of this approach produces an estimate of value for a property by comparing it with similar properties which have been sold recently or are currently offered for sale in the same or competing areas. Procedures used to estimate the degree of comparability between two properties involve sound judgment decisions concerning their similarity with respect to many value factors such as location, construction, age and condition, layout, equipment, design, utility, and desirability. The sale prices of properties judged to be most comparable tend to set a range within which the value of the subject property will fall. Further consideration of the comparative data should lead to a logical estimate of the probable price for which the property could be sold as of the date of the appraisal. This is the market data value indication.

Pertinent Data. The data involved in the application of this process applies to the comparable properties as well as to the subject property, and varies with the type of property. Three categories of data are sales, asking prices, and offers. These may be analyzed on the basis of four elements of comparison:

1. Time of sale, listing, or offer
2. Conditions influencing each sale
3. Location of each property
4. Description of land and improvements for each property.

In specific cases, as for example, income property, gross or net income figures for the comparable properties as well as for the subject property are essential; in a farm appraisal, the acreage production figures are important.

The market data approach has been referred to as the comparison approach, because it utilizes the process of comparison. However, since comparisons are made in each of the three ap-

proaches, the entire appraisal process is in one sense a series of comparisons, which are made in three categories: cost, income, and market.

Limitations. Although the market data approach has such wide application as a method of estimating value and is of primary importance where applicable, there are factors which may limit its usefulness. Examples of these limitations include the following:

1. No provision is made for arriving at an estimate of value in cases where there are no current sales of comparable properties, or there is no active market.
2. Since no two properties are identical, they vary at least in location, even if alike in other respects. All differences must be considered in the comparative process, with adjustments made for the degree of variation. The more factors to be compared and adjusted, the greater the number of decisions and judgments necessary. Minimal adjustment tends to increase reliability.
3. Depreciation affects value. Because improvements are dissimilar in quality of construction and materials, they depreciate at varying rates. Buildings constructed exactly alike may depreciate at different rates because of differences in maintenance, occupancy, and use. When substantial depreciation has accrued, its extent may be difficult to estimate.
4. Amenities, which may be intangible qualities, are difficult to compare.
5. Learning the exact conditions attending each sale is essential so that the validity of the sale as comparative data may be substantiated. If the owner had to sell and could not wait for an "informed buyer," he may have accepted a price not indicative of the property's market value. If the owner were not an "informed seller" and were unaware of the current market, the price he accepted may not indicate the property's value in the market. Many motivations lead to the transfer of real property at figures unrelated to the property's market value. Tax situations may affect the sale price. Transfers of property between relatives or at auctions may not give a true indication of market value.

In spite of its limitations, the market data approach has broad application in all appraisal work. The value estimate found by the use of this approach is usually considered particularly significant because it is an expression of the value established by actions of buyers and sellers in the market.

Income Approach

In using the income approach,♦ the appraiser is concerned with the present value of the future benefits of property ownership. This is generally indicated by the net income which a fully informed person is warranted in assuming the property will produce during its remaining useful life. After comparison of interest yields for investments of similar type and class, this net income is capitalized to an estimate of value.

Selecting the capitalization rate is one of the most important steps in the income approach. A variation of only one-half of one percent can make a difference of many thousands of dollars in the capitalized value of the income. For example, the difference between an annual net income (after provision for recapture) of $42,000 capitalized at 6% and at 7% is $100,000.

The four steps to be followed in assembling and processing income data may be summarized:◊

1. Obtain the rent schedules and the percentage of occupancy for the subject property and for comparable properties for the current year and for several past years. This information provides gross rental data and the trend in rentals and occupancy. This data is then compared and adjusted to an effective estimate of gross income which the subject property may reasonably be expected to produce.
2. Obtain expense data such as taxes, insurance, and operating costs being paid by the subject property and by comparable properties. The trend in these expenses is also significant.
3. Estimate the remaining economic life of the building to establish the probable duration of its income, or, alternately, estimate the suitable period of ownership before resale.
4. Select the appropriate capitalization method and the applicable technique and appropriate rate for processing the net income.

The income approach has its greatest usefulness in the valuation of income-producing property because the average investor in such property purchases it in order to receive future benefits (the

♦ See chapter on the Income Approach.
◊ See also the chapter on the Appraisal Report.

income). The investor in an apartment building, for example, anticipates an acceptable return on the investment.

Reconciliation of Value Indications

The final step in the appraisal process is the consideration of the indicated value resulting from each of the three approaches. Under no circumstances are these "averaged." It would be as illogical to do so as to ask three persons for the right time, and average the three replies. The appraiser considers the relative applicability of each of the three approaches to the final estimate of defined value.

After examining the range between his value indications, the appraiser places major emphasis on the one, or on those, which appear to produce the most reliable and applicable solution to the specific appraisal problem. He takes into account the purpose of the appraisal, the type of property, and the adequacy and relative reliability of the data processed in each of the three approaches. These considerations influence the weight to be given to each approach. For example, in the case of an owner-occupied factory, if the appraisal were being made for insurance purposes, the greatest weight might be assigned to the cost approach. In the case of an old and obsolete income-producing property, greater weight would be assigned to the market data and income approaches. In the absence of conclusive market data, it might be necessary to place more reliance upon the income approach.

A well-presented valuation analysis is concise and enables the reader to understand the problem and the factual data, and then readily to follow the appraiser's reasoning to his conclusion. An *estimate* of value is the appraiser's opinion, reflecting consideration of all of the data in the light of his experience and judgment. Only courts and legally constituted authorities *determine* value.

The Final Estimate and the Appraisal Report

The formal written presentation of the value defined, or question answered, the data considered and analyzed, methods used,

and the opinions and conclusions reached in formulating the final estimate of value, constitute the appraisal report. The report is the tangible expression of the appraiser's service. It is the medium by which he fulfills his agreement with his client and for which he will receive a fee. For these reasons alone, the manner in which it is written, the organization and presentation, and the over-all appearance are important elements in its preparation, as discussed in the chapter on The Appraisal Report.

CHAPTER FIVE

Economic Trends

KNOWLEDGE of the economic trends which affect the value of real property is important to the appraiser. It is evident that the principle of change is fundamental to real estate appraising. Nothing is static. Situations and values change, sometimes slowly, sometimes rapidly. Value is created and modified by economic, social, and governmental forces, acting outside the property itself. These forces are changing and reshaping continually, often in a cyclical pattern.

A trend is a series of related changes brought about by a chain of causes and effects. It is not enough to know that changes have taken place and are taking place. It is necessary to consider the direction of these changes, and their probable extent and impact, in order to identify a trend and permit a reasonable projection.

Identifiable Trends

To estimate value as of a given date is to estimate first the future benefits anticipated from ownership. These future benefits will be affected and shaped by the action of general and local forces, within which trends may be identified and projected.

General Economy

Although the appraiser's immediate concern is with the economic condition in the community and area as they relate to purchasing power, he is aware of trends indicated by national and international economic weather vanes, such as balance of foreign trade, rates of foreign exchange, commodity price levels, wage

levels, interest rates, industrial production levels, and retail sales.

The interplay of economic forces pulsates through all levels of the economy. Therefore, any change, good or bad, at any level in the economy can be compared to a stone dropped in a pond, disturbing the surface of the water and sending out encircling ripples. As the circle widens, the ripples lose intensity and strength.

The sensitive interweaving of these many influences in the national and regional economy can be applied to the general economy. The economic health and well-being of a nation affects all nations, directly and indirectly. Significant activity can be felt on the smallest local level. The greater the intensity of the change and the longer it endures, the wider is its influence.

National Economy

The state of the national economy is of primary concern to the appraiser. It may be prosperous and expanding, or depressed and declining. Its state depends on the conditions within the various sectors of the whole economy. These conditions include the status of domestic industrial, commercial, and agricultural activity. The strength of each of these economic segments contributes to the general state of the national economic health.

Regional Economy

The national economy also is the composite economic status of the nation's geographical regions. The economic health of a region depends upon the status of economic activities within the region. These activities are the aggregate of the economic activities of the individual areas and communities within its geographical boundaries.

The impact of any change depends in part on the intensity of its immediate or local effect and its duration. Minor disruptions may seriously affect a locality's economy; but if the region's and nation's are strong, the over-all effect is less. However, if the general economy is not well supported in all of its segments, the effect

of a minor change in one area could spread, undermining the economy of adjacent areas until the condition of the entire nation is affected.

Population

A direct relationship exists between the value of real property and population growth. Because land is fixed and the amount of land cannot be increased in response to change in demand, it therefore derives its value from the effective demand for it. Scarcity of land of a particular type in demand naturally results in a higher value. The demand for such land is in direct proportion to the number of people able and willing to buy, sell, or use it. Consequently, increasing land value generally reflects population growth. Today's births lead to tomorrow's demands, structuring the succession of future needs, including the amount of children's goods and services, education, recreation, and housing. These children progressively enter and leave the new markets, adding or subtracting from demands.

Demand exists for specific parcels for specific purposes, rather than for land in general. Population changes combine with industrial development and, in a broad sense, with the entire spectrum of human activity, to influence the value of real property. Value rises or falls in step with the changing geographic pattern of industrial expansion or contraction, and with the shifts in population which occur in response to these alterations in the pattern of industrial and other activities.

Property values are affected by the number of people in a region and community, and impending changes in the quantity or composition of this population. Pertinent information may be obtained from private fact-finding agencies or from detailed reports of government agencies, such as the Bureau of the Census. This latter data, reported for geographically outlined districts called census tracts, indicates trends within an entire metropolitan area and its components. Also shown are the type of population

as well as its rate of increase or decrease in any area in relation to the rate of change for any other community in the state and for the nation.

Purchasing Power

A most significant facet of population growth is purchasing power, or the economic ability of the population to satisfy its desires and needs. The purchasing power of the population depends on a multitude of factors which affect the value of real property. These factors include such conditions as the imminence of war, war itself, or postwar readjustment; the number of people employed in basic industries and in service industries; farm prosperity, the level of farm subsidies; the current level of commodity prices; the figure for gross national product per person, violent storms, floods, or earthquakes; strikes; the availability of credit, interest rates, and the purchasing power of the dollar.

An individual's capability to purchase what he desires has been described as one of the elements of value. The appraiser understands that the value of residential real estate depends in part on the individual's purchasing power. Accordingly he considers all developments which tend to affect the ability of an individual to purchase real estate.

Although purchasing power depends upon income, it does not equal income because a part of income must go for taxes. The balance, termed disposable income, is spent for many commodities and services. The manner in which it is expended affects the value of the real property involved in providing those commodities and services. A major share of disposable income is expended on the necessities of living, which include housing. The remainder could be spent for nonessential commodities and services, or part could be saved. This residual portion of disposable income has the most direct effect on property value. The larger the portion, the greater is its effect. For example, the amount available for the purchase of automobiles can tax the industry's capacity to produce. This necessitates the construction of new facilities which

in turn increases the value of new property and enhances the values in adjacent areas. On the other hand, it can have the reverse effect when the margin of disposable income shrinks to a point sufficient to cover only necessities.

The appraiser is concerned with the status of disposable income in his community. The stability of property values depends upon local purchasing power. Any increment in value depends upon the amount and duration of the marginal disposable income.

Thus population growth coupled with sustained purchasing power maintain and enhance present values, at the same time creating new values. The outward pressure of urban population growth plus its disposable income cause the conversion of farm acreage into suburban communities. Within these, the value of certain areas increases as they are developed into shopping centers, industrial parks, or residential uses.

Among pertinent statistics which may be accumulated as reflecting impact on purchasing power are those relating to employment and to disposable income. Newspapers and chambers of commerce frequently make regional studies of employment; and federal and state agencies often prepare state-wide, regional, and city-wide studies. A variety of statistical material is available.

Studies relating to disposable income are reported annually in many business and government publications. These studies list, by city or trading area, the amount of money which the average family has to spend after paying income taxes. Trends over a period of years also are frequently tabulated. As an example, the disposable income per family determines the volume of retail buying. This in turn usually helps to establish a base supporting the store rentals which merchants can pay; and again, this influences the value of the real estate occupied by the merchants.

Price Levels

The value of real property is affected when the general price level rises or falls, quite apart from the level of supply and demand for land and buildings. The reason is that physically a building

is merely an accumulation of materials. If the prices of steel, sand, gravel, cement, and lumber decline, then their dollar values decline, whether they are piled in a building supply dealer's yard or assembled in a building. The converse also applies.

The cost-of-living index, which is widely used in business summaries and for the adjustment of wage contracts, is an important appraisal tool. There are available records of the wholesale price index and of other selected price indices, as well as price movements which indicate whether or not the current prices of commodities are static, rising, or declining. Study of the causes and effects of these movements and their impact on real estate may be useful.

Building Cycles

Business cycles are periodic movements around long-term economic trends. Efforts to curtail the production of items which cannot be produced at a profit, and concurrent efforts to accelerate the production of items which can be produced profitably, are responsible for the cycles of overproduction and underproduction; for example, in the automobile, textile, and building industries. There are also clearly established cycles of production in agriculture. The duration of both the industrial (urban) and the agricultural (rural) cycles is affected by the length of time it takes to create and reduce surpluses.

The building industry has an important influence on business cycles. Real estate is one of the primary supports of national prosperity. A high rate of building activity is accompanied by a correspondingly active demand for all the commodities and furnishings involved in housing and in man's activities. Conversely, reduced construction activity serves as a brake on prosperity.

Overexpansion in the building industry is directly reflected by an excess supply of improved property and a consequent adjustment in real estate prices. Conversely, a period of curtailed building activity is directly reflected by a shortage and consequent increase in demand, which in turn is reflected by higher property

values. In addition, it is important to consider the influence of the general price level in relation to the principle of supply and demand.

Four possible combinations of supply of, and demand for, property and the general price level are of major importance:

1. A shortage of buildings at the bottom of a cycle, followed by a rising demand during a period of rising prices
2. A shortage of buildings at the bottom of a cycle, followed by a rising demand during a period of falling prices
3. A surplus of buildings at the top of a cycle followed by a decreasing demand during a period of rising prices
4. A surplus of buildings at the top of a cycle followed by a decreasing demand during a period of falling prices.

An examination of any treatise on the economic history of the United States* discloses that all of these combinations are illustrated in various periods of the nation's history.

Probably no other period in history has been so affected by technological developments as the third quarter of this century. Airplane transportation has been universally accepted as a means of passenger travel, not only regionally and nationally, but also internationally, resulting in new dimensions of time and distance. Improvements in the operation and comfort of the automobile and the development of expressways have revolutionized local, regional, and interstate travel. Television and radio have had not only an adverse effect on newspapers and magazines, but have changed the whole pattern of national communications and, to some extent, the entire entertainment business as well as many conventional patterns of living.

Even greater impact, so far as real estate is concerned, has been the development of air conditioning and advanced systems of heating and ventilation which provide comfort at reasonable cost in offices, factories, and stores. It also provides livable climatic conditions in many areas suitable for residential development

* For example, Donald L. Kemmerer, *Economic History of the U.S.* (Totowa, N.J.: Littlefield & Adams, 1954).
Paul A. Samuelson, *Economics* (9th ed., New York, N.Y.: McGraw-Hill, 1973).

which were formerly considered undesirable for year-'round living.

The airplane and the automobile, shifting retail emphasis from the downtown district to convenient suburban centers, have changed the focus of city planning. Central business district uses in large cities, including many department stores and retail specialty shops, hotels and office buildings, have decentralized to strategic suburban areas accessible to superhighways and airports.

Other technological developments, as well as economic and social changes, generally have had a significant effect on the use and value of real estate. At the same time, the development of new techniques for the assembly and analysis of data, including use of computers and data storage banks, has placed new demands on the real estate appraiser and broadened his field of activity.

Since World War II there has been a very definite trend from what was generally considered to be a free-moving capitalistic economy toward a political economy largely controlled by a multitude of government commissions and study groups. These are often oriented toward social and political considerations, rather than toward the conventional economic objectives, which were formerly considered standard business practices.

This trend has resulted in restrictions in the productivity of real estate which have a pronounced effect on its value in the market. The long-time effects of this transition are not yet fully apparent. Some governmental regulations have undoubtedly produced and will continue to produce a favorable social dividend, whereas others may not. The effectiveness of such regulations will undoubtedly contribute to both social and economic welfare in direct proportion to their timing and the intelligence with which they are devised and enforced. Furthermore, all regulations involve costs, which have an impact on value. Only where costs of governmental regulation contribute directly or indirectly to an increase in, or maintenance of, real estate values, are they economically warranted in terms of the value of real estate and its productivity.

As the 21st century approaches, an estimate of future conditions and trends necessitates an interpretation of cyclical movements by considering how the government probably will act on the matter of imposing or lifting controls.

Economic Indicators

The importance of supply and demand has been presented in an earlier chapter, Basic Principles of Real Property Value. In estimating the future demand for all types of real estate, consideration must be given to the trend of all the factors that influence supply and demand. Among such factors to be considered are the following:

Demand factors† include:

1. Population, rate of increase or decrease, and age distribution
2. Geographic factors, such as climate and topography, and natural or man-made barriers
3. Land use and city growth
4. Types, services, and costs of transportation; and highway systems
5. Sources and levels of employment and rate of unemployment
6. Average wage rates and disposable income . . .
7. Financial aspects such as personal savings, mortgage lending, and insurance rates
8. Cultural and religious institutions
9. Educational institutions
10. Health and medical facilities; fire and police protection
11. Tax structure and assessments.

Supply factors† include:

1. Volume of new construction
2. Availability and price of vacant land
3. Construction (costs of labor and materials)
4. Volume of available houses (new and old)
5. Owner-occupancy versus tenant-occupancy
6. Causes and amount of vacancy
7. Impact of building codes and zoning ordinances on construction.

Other factors include the increase of leisure time, size of households, and environmental control.

† These demand and supply factors are from Jerome Knowles, Jr., "City and Neighborhood Data and Analysis," *The Appraisal Journal,* April 1967, p. 261.

Taxes

Real estate is taxed on an ad valorem basis or an amount of dollars per year related to its assessed value. If the tax rate is \$60 per \$1,000 of valuation, and the assessed value of a property is 50% of its market value, then this parcel is taxed in the amount of 3% per year of its worth: $\frac{60}{1000} \times 50\% = 3\%$. In another example, if the gross annual rental income is 12½% of the market value, and if annual real estate taxes are 2½% of market value, then one-fifth of the gross income must be allocated for payment of taxes.

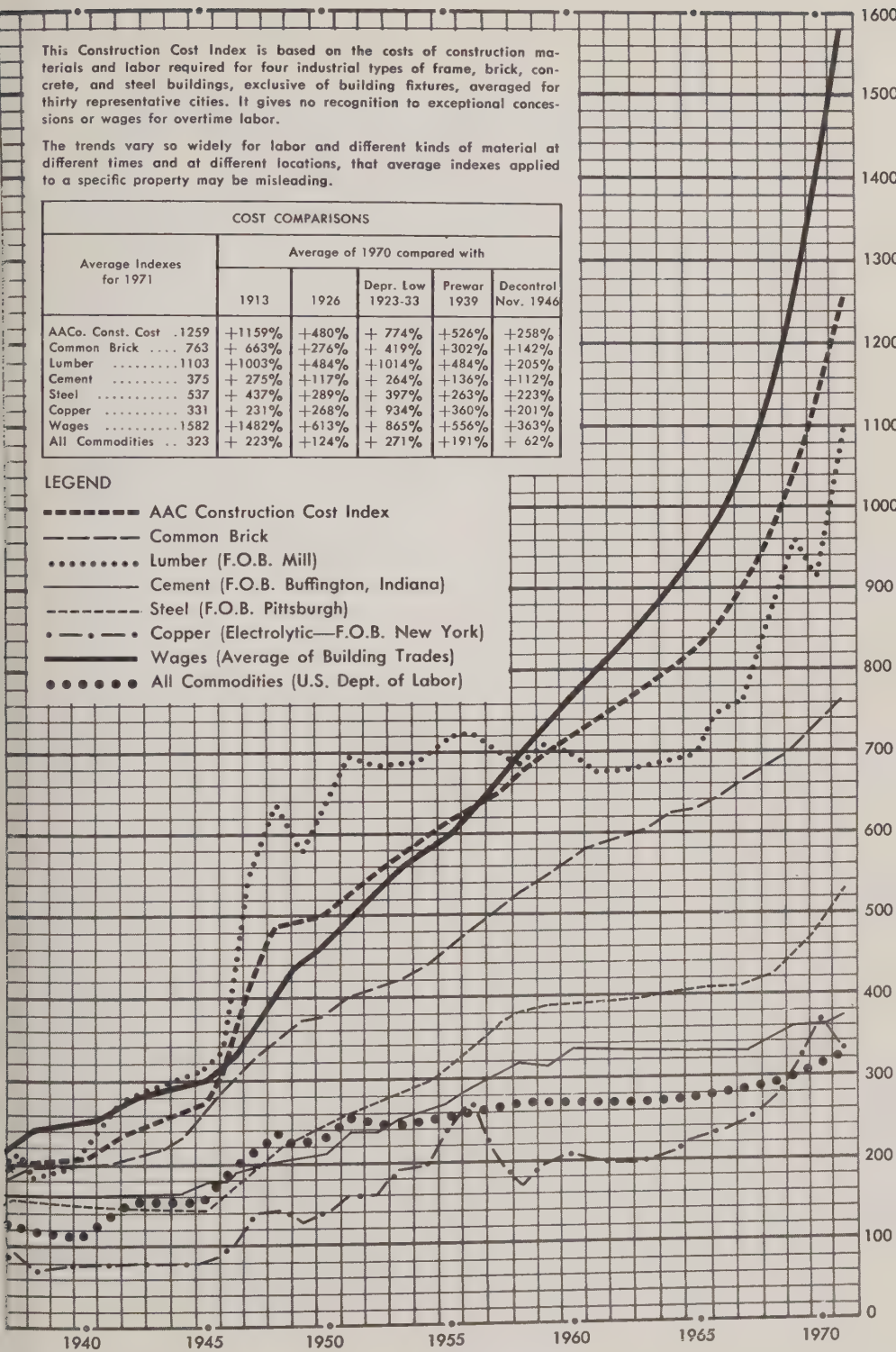
In some communities the trend in real estate taxes is a very important consideration. In cities with an increasing trend of public expenditures for schools and municipal services, a heavy burden of taxation may adversely affect the level of real estate values. Under these circumstances, new construction may be discouraged in such an area. Appraisal services may be required where ad valorem real estate tax assessments bear an established or provable relationship to market value.

Income taxes are not treated as an expense in the appraisal process, except in certain specialized situations. Among these exceptions are cases where various properties are included as an integral and essential part of technological operations (such as a public utility), and where the net income of the entire operation is being capitalized, usually because it is impossible or impractical to separate the real estate from the business operation. Increasing in importance is the influence of tax regulations on the price and value of real estate, in certain situations. Accordingly, although this is the specialized area of the accountant or the income-tax expert, the appraiser should have some general knowledge of the substance and trend of federal and state income-tax regulations as they tend to affect real estate values.

Building Costs

The cost of reproducing a building tends to follow general price levels established over a long period. However, they vary

Construction Trend Chart 1936–1972



This Construction Cost Index is based on the costs of construction materials and labor required for four industrial types of frame, brick, concrete, and steel buildings, exclusive of building fixtures, averaged for thirty representative cities. It gives no recognition to exceptional concessions or wages for overtime labor.

The trends vary so widely for labor and different kinds of material at different times and at different locations, that average indexes applied to a specific property may be misleading.

COST COMPARISONS					
Average Indexes for 1971	Average of 1970 compared with				
	1913	1926	Depr. Low 1923-33	Prewar 1939	Decontrol Nov. 1946
AACo. Const. Cost .1259	+1159%	+480%	+ 774%	+526%	+258%
Common Brick 763	+ 663%	+276%	+ 419%	+302%	+142%
Lumber 1103	+1003%	+484%	+1014%	+484%	+205%
Cement 375	+ 275%	+117%	+ 264%	+136%	+112%
Steel 537	+ 437%	+289%	+ 397%	+263%	+223%
Copper 331	+ 231%	+268%	+ 934%	+360%	+201%
Wages 1582	+1482%	+613%	+ 865%	+556%	+363%
All Commodities .. 323	+ 223%	+124%	+ 271%	+191%	+ 62%

LEGEND

- AAC Construction Cost Index
- Common Brick
- Lumber (F.O.B. Mill)
- Cement (F.O.B. Buffington, Indiana)
- Steel (F.O.B. Pittsburgh)
- Copper (Electrolytic—F.O.B. New York)
- Wages (Average of Building Trades)
- All Commodities (U.S. Dept. of Labor)

1600 1500 1400 1300 1200 1100 1000 900 800 700 600 500 400 300 200 100 0

1940 1945 1950 1955 1960 1965 1970

Average 1913 = 100

Used with the permission of The American Appraisal Company, Inc.

from time to time and from place to place. Building costs generally decline in times of deflation and increase with inflation. A comparison of the cost-of-living index and adjusted construction cost index covering 1940–1970 illustrates the effects of wars, followed by inflation, on the economy and building costs.

COMPARATIVE COSTS
CONSTRUCTION VERSUS COST OF LIVING

Year	*U.S. Department of Commerce Composite★ (1)*	*American Appraisal Co. Index★ (2)*	*Cost of Living Wholesale Price Index★ (1)*
1940	56	31	43
1945	48	44	58
1950	77	76	87
1955	90	93	93
1960	103	110	101
1965	115	126	103
1970	152	175	117

★ 1957 = 100.

SOURCE:

1. U.S. Department of Commerce: *Business Statistics.*

2. *1971 Construction Cost Chart:* Materials and labor, four industrial types (frame, brick, concrete, and steel) for 30 representative cities. American Appraisal Company, Inc., Milwaukee, Wisconsin (see graph). (1913 base figures have been adjusted to a 1957 base.)

Interest Rates

Real estate activity is closely related to the supply and availability of money. Most real estate is purchased subject to financing; transactions, then, are dependent upon the availability of mortgage money, and the current lending policies of insurance companies, mortgage houses, and other sources of funds. An understanding of the money market involves familiarity with the sources of money being loaned on the various types of real estate in which each lender specializes.

The source of savings and loan associations' funds, for example, is the pooled financial resources of individuals and private organizations together with vast sums of money which these associations may borrow from federal government agencies. Life insur-

ance companies also administer large sums of money which they collect as premiums on the various types of insurance policies that they write, as well as from incomes on their investments and from capital gains on their sales of securities, real estate or other assets.

Thus availability of financing depends largely upon the ability and willingness of individuals and private organizations to save and to conserve their resources. Premiums paid by policyholders are the source of insurance company money. Availability of this important source of mortgage money is controlled by the ability and readiness of people to buy insurance.

The appraiser's study of financial trends includes the activities of related federal agencies. Public financing of construction projects results in building activity which otherwise might not be carried on. Such government initiative can stimulate demand for real estate.

Interest rates on funds borrowed in the money market fluctuate upward or downward in accordance with a number of factors, including the existing supply of, and demand for, funds.

All investments in real estate or real estate equities are competing—in regard to both rate of interest and advantages offered —with all other real estate or nonreal estate investments. Therefore the rates of interest on real estate investments fluctuate with interest rates and relative risks and advantages of categories of competitive investments.

Other Trends

The closer the appraiser's activities approach the counseling of clients, the better acquainted he should be with general trends. Just how much information is necessary to complete an appraisal assignment depends upon its nature. It is possible to compile so much information as to become bogged down.

A principal index of real estate activity is the number of deeds filed. County recorders' offices frequently keep a count of the number of deeds filed for record in a month and in a year.

Generally, an increase in the number of deeds filed indicates an increase in sales or transactions (unless they are foreclosures). This, in turn, usually signals a strong market. Study of such information leads to a better understanding of business cycles.

Economic trend information is also available from such sources as the Regional Surveys of the Federal Reserve Bank, U.S. Department of Commerce, Bureau of the Census; universities; publications of real estate—and other—trade associations; savings and loan associations and banks. Their statistics include retail sales indices for department stores and retail specialty shops. Such sales volume figures are significant because they reflect economic trends.‡

Summary

There are many available sources for all aspects of economic trends. Subjects include price levels, purchasing power, population figures, rental and operating trends, building cycles, government regulations, construction costs, and interest rates. It is useful to possess a general knowledge of the history of the reasons for these economic phenomena and the direction of their trends. The appraiser's analysis and value estimate should reflect only those elements with a demonstrable impact on market value, and none that are conjectural, remote, or speculative.

‡ Editor and Publisher, *Editor and Publisher Market Guide* (New York, N.Y.: annually).

Joint Economic Committee of Congress, *Statistical Indicators* (Washington, D.C.: U.S. Government Printing Office: monthly and weekly).

National Retail Merchants Association, *Retail Control (Controllers' Congress)* (New York, N.Y.: monthly). (Originally published by Harvard University Graduate School of Business.) Operating figures, department and specialty stores.

U.S. Department of Commerce, Office of Business Economics, *Economic Indicators* (Washington, D.C.: monthly).

U.S. Department of Commerce, Bureau of the Census, *Statistical Abstract of the United States* (Washington, D.C.: annually).

U.S. Department of Commerce, *Survey of Current Business* (Washington, D.C.: monthly). Biennial supplement to this is *Business Statistics.*

CHAPTER SIX

Neighborhood Analysis

A REAL PROPERTY is an integral part of its neighborhood. It cannot be treated as an entity apart from its environment created by the interplay of a multitude of economic, social, physical, and governmental forces. The value of real property is not intrinsic, resulting exclusively from the physical characteristics of the property. Therefore an analysis of the forces currently influencing the neighborhood identity is necessary to comprehend their effect upon probable trends in value. As all properties share the future of the neighborhood with which they are identified, their values may fluctuate, owing to the action of environing forces.

Neighborhood Patterns

The term neighborhood cannot easily be defined. A neighborhood is a segment of a city, a town, or a village; or it may be an entire community. Every city began as a community—a neighborhood. It may help to understand modern neighborhoods if the original reasons for establishing the community are reviewed. Some of these reasons may have included:

1. A need for safety afforded by numbers
2. The desire for companionship
3. The wish to enjoy greater cultural advantages
4. The incentive to engage in commercial pursuits.

Within a community there is a marked tendency toward the grouping of land uses. The areas devoted to these varied uses are physical neighborhoods. A neighborhood, then, may be more spe-

cifically defined as a homogeneous grouping of individuals, buildings, or business enterprises within, or as part of, a larger community. These groupings may be devoted to residential use, trade and service activities, industrial activities, or cultural and civic activities.

Residential neighborhoods assume many of the characteristics of the individuals who live in them. These neighborhoods express the mutual desires of people with comparable interests, related traditions, and similar social and economic status.

Commercial or industrial neighborhoods are areas in which the predominant land use is devoted to these activities. A downtown commercial district usually can be clearly mapped, with its main streets, mass transportation lines, and traffic arteries fanning out to the residential neighborhoods. The string type of store district may appear along the major arteries, punctuated by more intensive groupings at important traffic intersections or former transportation transfer points. A neighborhood or a regional shopping center is a cluster of retail trade and service establishments supported by a primary trading area composed of residential neighborhoods.

Industrial neighborhoods once tended to be concentrated along waterways or railroads, ribbon fashion. More recently they have been developed in the form of industrial centers or parks on the peripheries of cities. Related industries tend to be grouped in a geographical area to which they have been attracted by abundant natural resources, availability of trained labor, interlocking interests, or a combination of these.

Farm communities are characterized by size of operation, type of ownership, soil, crops grown, or land use. The boundaries of farm communities may cover several counties or still larger areas.

Neighborhood Boundaries

Neighborhoods may be of varying sizes but generally they are considered to be homogeneous in some respect. Sometimes neighborhood boundaries may be clearly defined (for instance, by a

distinct change in type of land use or in the character of the inhabitants or buildings). Sometimes boundaries are natural barriers, such as topographical features, lakes, rivers, or streams; or man-made barriers, such as canals, railroad rights of way, or traffic arteries. The boundaries of a given property's neighborhood encompass not only the improvements adjacent to it, but also the background which determines the use and value of the immediate section. This characteristic is most applicable to a commercial property. Its neighborhood consists not only of the store district, but also of the extent and character of the trading area from which it draws its economic support.

In defining neighborhood boundaries, a unified area is identified with a fairly homogeneous population in which the inhabitants have a more than casual community of interest. In such an area the character of one property affects the character of all others, as though all were cogs in a machine. Consequently, neighborhoods are not isolated sections. Each district of the city is dependent on all the other districts, the city itself, and its entire economic area.

Shifting Nature of Neighborhoods

Neighborhoods are not fixed in characteristics. They are always changing, some very slowly, others rapidly. Often they work against one another. In any relatively stable city, for example, the rapid growth of one district could mean the decline of a competitive district. A city's growth may reach the point where accessibility to the center is difficult from the more remote districts. In these instances, the establishment of new business centers better serves the needs of these outlying neighborhoods. Thus commercial subcenters come into being and the city pattern becomes complex. The suburban business centers may adversely affect the central business district. The newer residential areas may affect the old. Generally, people who can afford it move into the new areas. When this happens to older areas, the new residents of the older areas are usually of lower economic status.

If the neighborhood is so located as to be ripe for conversion to a more intensive use, the existing improvements may be torn down to make way for redevelopment.

The growth of the city results in changes in the utility of parcels of land and their improvements. In some instances, utility is increased; in others, decreased. Changes in value result. No neighborhood is absolutely static. Changes may be proceeding at a slow pace (which is usual), but they are always present.

Analyzing the Residential Neighborhood

A brief analysis of the nature of the typical residential neighborhood discloses that retail stores, service establishments, schools, churches, theatres, libraries, and parks may be considered necessary because they serve the needs of the inhabitants.

In neighborhood analysis, the consideration of amenities* is of major importance. Other terms of reference are encroachment† and infiltration.‡ In the pattern of city growth, residential neighborhoods exist around the core, which is comprised of the commercial and industrial areas of the city. As the city grows, the core enlarges and encroaches upon the residential areas. New residential areas come into being on the periphery, which may cause the old dwelling districts to lose desirability for residential purposes.

Residential neighborhoods typically pass through three stages:

1. Growth—a period of development during which the neighborhood is established and gains public favor and acceptance
2. Stability—a relatively static period which may be fairly transitory or of comparatively long duration

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* "The qualities and state of being pleasant and agreeable. In residential appraising, those peculiar and intangible benefits of homeownership, such as satisfaction of possession and use arising from architectural excellence, scenic beauty, and desirable social environment." American Institute of Real Estate Appraisers, *Appraisal Terminology and Handbook* (5th ed., Chicago: Author, 1967), p. 10.

† The act of trespassing upon the domain of another. Partial or gradual displacement of an existing use by another use, as locating factories in a residential district. *Op. cit.*, p. 69.

‡ The gradual displacement of the present residents by people of a different economic status and/or different social and cultural backgrounds. *Op. cit.*, p. 107.

3. Decline—a period of diminishing desirability and ultimate disintegration.

An understanding of neighborhood trends and their influence upon value involves considering the relevant physical, social, economic, and governmental factors. Each of these categories includes various considerations, such as:

PHYSICAL

1. Relation to the rest of the city
2. Street patterns and width of streets
3. Convenience to public transportation
4. Quality of, and convenience to, schools
5. Quality of, and convenience to, stores and service establishments
6. Convenience to parks, recreation areas, and churches
7. Pattern of land use, shape and size of lots
8. Visual aspects, geographical and topographical features, and climate
9. Availability and quality of utilities
10. Nuisances and hazards such as fog, smoke, smog, and industrial noises and vibrations

SOCIAL

1. Homogeneity of social and economic characteristics
2. Social prestige
3. Attitudes toward law and order
4. Family sizes and age groups

ECONOMIC

1. Degree of thrift and homeownership
2. Rent and income levels
3. Vacancy of residential units
4. New construction and vacant land
5. Attitude of financial institutions
6. Growth of the neighborhood
7. Changing use

GOVERNMENTAL

1. Special assessments
2. Tax burden
3. Zoning and building codes
4. Other regulations restricting design or use.

Physical Considerations in Neighborhood Analysis

Although it is not always essential to delineate definite boundaries for the neighborhood being analyzed, it is highly desirable to know the extent of homogeneous development radiating in all directions from the property being appraised. If the area is of considerable size, the possibility of adverse effect from undesirable developments in adjacent neighborhoods decreases as distance from the outer edges of the neighborhood increases.

Well planned city streets discourage intercity and interneighborhood traffic from penetrating a residential area. Curvilinear and dead-end streets reduce traffic hazards. Curving streets and wide boulevards usually make a neighborhood more aesthetically attractive. Street patterns are one of the factors which attract buyers to a neighborhood. The relationship of the neighborhood's street pattern to main traffic arteries and to the over-all local transportation situation must be considered; equally significant is the neighborhood's distance from employment centers and shopping centers.

Transportation. Time consumed in traveling to desired destinations, cost of transportation, and frequency of service are important considerations in making comparisons between various areas. The modern trend to superhighway and limited-access highway systems and the extension of public transportation are bringing the city and its satellite areas closer together, permitting wider population dispersion without proportionate increase in travel time. The most suitable type of transportation facility depends largely upon the income level of the people being served. It is not enough to note that transportation exists; the kind of service given and how it relates to the needs of the passengers are also pertinent.

Adequate public transportation to the downtown area and to principal centers of employment are still major considerations in valuation, despite the increased dependence upon privately owned transportation. Public transportation is important to the many people who do not have automobiles, or who prefer not to use

them for daily transportation to places of employment, to avoid traffic congestion, inconvenient parking, or the increasing cost of daily parking in downtown areas. Residential properties located in remote sections or having slow and infrequent public transportation tend to command lower rentals and prices than do properties more conveniently located or having better service.

Distance from public transportation is important only in terms of the people to be served. To a family living in an exclusive area and owning two or more cars, usually it is not imperative to be located close to public transportation lines; but they do not want to be so far away that transportation for domestic help becomes a problem. Apartment dwellers, on the other hand, dislike traffic noise, but usually prefer to be within convenient walking distance from public transportation. For most of them, to be too far away is less desirable than to be too close.

A study of a neighborhood's transportation facilities takes into consideration the territory through which users of these facilities must pass. People dislike walking along poorly lighted streets and through rundown areas. Another factor is the type and adequacy of transportation to schools and other centers of activity. Generally, it may be concluded that almost everyone—whether living in homes or in apartments, owning two cars or none—is interested in transportation. Ordinarily, the closer to good public transportation, the wider is the market for a property.

Balance in Land Use. Families are attracted to a neighborhood by good schools of their choice. Compared with high schools, access to elementary schools is more important, whether by walking or by school bus.

Most people prefer to live within reasonable walking distance of convenience stores and service establishments, although this may become less important in suburban areas, due to an increasing number of multi-car families. Despite the widespread desire to be near sources of supplies and services, residential properties bordering on shopping centers or in proximity to commercial districts may have less salability because of traffic, noise, flood-

lighting, or unsightliness. Most people require adequate and convenient shopping—but not adjacent to their homes. Modern shopping centers, whether neighborhood or regional, usually provide the neighborhood with a sufficient range of goods and services.

Some of a neighborhood's recreational facilities are commonly associated with its schools; but it is to a neighborhood's advantage to offer ample, well-supervised parks, beaches, pools, ice rinks, baseball diamonds, and tennis courts. These help to keep children off the streets and constructively occupied. A neighborhood is improved further if it provides adequate group activities (such as fraternal organizations, country clubs) for its adult population. In many instances churches create a demand for property by their members. Cultural institutions such as libraries, colleges and universities also influence the neighborhood pattern.

The highest efficiency in the use of urban land is the result of a proper balance between different types of use. Such a balance is attained when the right amount and kind of land is used for residential purposes; when the proper areas are zoned for commercial and industrial use; and when land is correctly allocated to other forms of use, such as parks and playgrounds.

Value is maximized when the land-use pattern is ideally balanced; value is reduced when uses are imbalanced. Unfortunately practice has not conformed to principle. The incompatible land-use patterns which exist in many major cities exemplify lack of ideal balance. However, progress is being made through the increased activity of city and regional planning agencies which implement sound land-use principles.

Natural and Man-made Environment

A neighborhood may be well designed and developed but its desirability is reduced if it must be approached through unattractive and overcrowded districts. Consideration must be given to the appearance and the condition of streets, sidewalks, lawns, landscaping, buildings, and vacant lots. The architectural styles in a neighborhood also have a bearing on its desirability. Preva-

lence of a currently popular design is a favorable influence; and good maintenance of older buildings, prompted by a pride of ownership and occupancy, attests to the character of the residents.

The presence of a lake or river, a bay or swamp, or a hilly area in or contiguous to a neighborhood may constitute an advantage or disadvantage. These features may endow an area with a scenic advantage uncommon to other sections. A hill may mean little in a rugged section, but an elevated or well-wooded section in a predominantly flat area could enhance the value of property. A river subject to severe flooding would be a negative factor and the value of homes along its banks would reflect risk from such a hazard.

Topographical conditions can endow a neighborhood with protection against wind, fog, or flood; or they can expose it to danger or damage from these forces. A geographical feature, such as a river, lake, or park, may serve as a buffer to protect a residential district from encroachment by commercial or industrial enterprises.

The invasion of a residential neighborhood by commercial or industrial usages generally constitutes a depreciating factor. However, the value of the site occupied by the new use frequently increases. This increase might partially or even entirely offset the decreased value of a specific property; but the encroachment of nonresidential uses can injure the neighborhood as a whole.

Exposure to odors, smoke, dust, and noise from commercial or manufacturing enterprises limits a neighborhood's desirability. For example, the physical presence of a nuisance depreciates the value of a home which is located across the street from a tavern. Some areas are liable to such hazards as the possibility of floods, landslides, aircraft accidents, or perhaps so common a problem as an excessive volume of automobile or truck traffic. Not every hazard is readily apparent; but the possible existence of any threat to value should not be overlooked.

Provisions for gas, electricity, water, telephone service, and storm and sanitary sewers are essential to meet the standard of

living in municipal areas. The availability and adequacy of these services affect a neighborhood's desirability. A deficiency in any one tends to decrease value. If water and sewage facilities have not yet been installed, the value of land is regularly less than the value of the same or similar land after installation has been accomplished.

The record and potential of public and private water companies and the availability of water supply to serve private sewer and water systems should be explored in local areas. Water tables in unincorporated areas, septic tank regulations, and soil permeability should be investigated.

Social Considerations in Neighborhood Analysis

The value levels in a residential neighborhood are influenced more by the social characteristics of its present and prospective occupants than by any other factor. Hence, social data is a major consideration in residential appraising.

No matter how attractive a particular neighborhood may be, it does not possess maximum desirability unless it is occupied by people who are reasonably congenial. This implies a community of interest based upon common social or cultural backgrounds. Above all, home purchasers with children usually desire the best advantages that they can afford; and this includes compatible families as neighbors.

Any analysis of value must take into account the fact that basic changes in the character of the residents of a neighborhood may favorably or adversely affect the value of properties located therein. Neighborhoods tend to be composed of residents having similar vocations or professions. However, the margin of social difference between the skilled factory worker, the supervisory employee, and the clerical office worker is steadily diminishing.

Facts about the age distribution of the residents are useful in judging the life-stage of a neighborhood. Long bound together by vocational, social, racial or religious ties, a neighborhood may

nevertheless tend to change its character or to develop into a tenant-occupied district, as children mature, marry, and move away. This development tends to change the neighborhood's social structure, and may alter values.

Economic Considerations in Neighborhood Analysis

The higher the percentage of homeownership in a neighborhood, the more pride is visible in the appearance of its properties, and the more community responsibility is felt by its citizens. Pertinent statistics regarding the percentage of homeownership may be available from census data and city directories, or may be obtained by spot-checking an area.

Rental data provides clues to the financial capability of a neighborhood's occupants. Their income levels also are revealed by census information, newspaper surveys, and private studies. Such information indicates the price levels which the residents can afford for the rental or purchase of property.

Vacancy statistics frequently are compiled by newspaper and other fact-finding agencies. Other significant statistics include the quantity of classified newspaper advertising for rent or for sale. This data helps the appraiser to estimate the strength of housing demand and the extent of supply.

The existence of vacant lots or acreage suitable for development may forecast much construction activity, or it may indicate a lack of demand. Current construction creates trends which affect the value of existing improvements. Careful study of these factors is helpful in rating the probable future prestige and desirability of an area.

Useful information as to the character and trend of an area may be obtained also by checking the attitudes of banks, savings and loan associations, and insurance companies concerning their loan policies with respect to the locality. A good rating results in more favorable financing terms and generally improved sale prices.

Block-by-block information helps to pinpoint directional trends

of growth. A neighborhood may be growing, it may be static, or it may be deteriorating. The population trend may be indicated by census studies, particularly when data is available concerning individual tracts. The trend of population growth is an indication of the neighborhood's economic health, as well as a clue to the economic health of the community of which the neighborhood is a part.

Governmental Considerations in Neighborhood Analysis

Tax burdens are greater in some areas than in others. Where these areas are in the same community, variations in taxes are significant in making comparisons. Sometimes special assessment levies in a certain location become so heavy that they seriously affect the marketability of property. The benefits resulting from special assessments frequently do not enhance the obtainable sale price in proportion to their cost; nevertheless, the costs must be offset. As a rule, properties that are otherwise comparable to those not subject to special assessments can be expected to bring a lower sale price. For example, assume that two identical properties, located in the same block but on different streets, are each worth $22,000 if free of encumbrances. If however one were subject to a $500 special assessment lien, its value would be in the nature of a $21,500 equity ($22,000 subject to a $500 lien).

Divergent tax rates may similarly affect value. Local taxes may favor or be discriminatory against certain classes of property. It is advisable to examine the local structure of assessed values and tax rates to compare the burdens created by various forms of taxes, and their apparent effect on the value of different classes of real estate.

Sound judgments about neighborhoods or individual properties cannot be made without adequate data concerning public and private restrictions. These include zoning and fire ordinances; building, plumbing and sanitary codes; and other governmental controls.

The Federal Housing Administration in its underwriting proc-

ess has established procedures for neighborhood analysis. These well-organized procedures have proved to be an effective method of property and neighborhood rating. They are thoroughly described in the FHA's underwriting manuals.[§] Other governmental agencies also have developed effective and useful procedures which they use in neighborhood analysis.

Among the principal factors which improve value in private residential neighborhoods are these:

1. Schools, churches, recreation facilities, and other amenities
2. A homogeneous population with a sense of civic responsibility
3. Prestige and visual appeal
4. Satisfactory transportation facilities and good approaches
5. Natural topographical and geographical advantages
6. Good planning and adequate utilities
7. Conformity in land use and sensible zoning.

It is the appraiser's minimal task to analyze the neighborhood in accordance with these advantageous factors as well as those which depreciate value. Among the latter are:

1. A tendency among a neighborhood's inhabitants to think it is losing desirability because of an influx of people of a different economic, social, or cultural status
2. The movement of commercial and industrial uses into the area
3. Miscellaneous factors such as lack of zoning protection, increasing taxes, reduced rental and sales values of surrounding properties, lack of adequate planning (congestion, mixture of architectural styles, lack of trees and landscaping), lack of community pride as evidenced by poor maintenance, and pollution from smoke, noise, and traffic.

Analyzing the Apartment Neighborhood

Apartment districts differ in some degree from single-family residential areas, but are influenced by many of the same factors which affect private homes. A residential neighborhood usually comprises a geographical area of considerable extent. In large cities an apartment district usually covers an extensive area, but

§ *Underwriting Procedures, FHA Manual* (HUD), Government Printing Office, Washington, D.C., 1934– (looseleaf), periodically updated with supplements.

in the smaller cities it may be quite limited in size, dispersed or not defined. Apartments may take the form of multi-story, garden,* row or town houses, and may take on the character of individual homes in the form of cooperatives♦ or condominiums.◊

The factors and amenities which affect the apartment neighborhood may be outlined▲ in the same way as for the private dwelling district, but with some change of emphasis. In an apartment area, desirability and value are influenced by the following:

1. Convenience to places of employment
2. Adequacy of transportation service
3. Convenience of access to shopping centers, churches, theatres, and cultural institutions
4. Presence or absence of convenient school facilities and their significance to the tenants
5. Reputation of neighborhood and its freedom from objectional social or cultural conflicts
6. Residential atmosphere, appearance of neighborhood, and adequate protection against unwanted commercial and industrial intrusion
7. Proximity to parks, lakes, rivers, or other natural advantages which make residence more desirable; this involves the extent to which others' enjoyment of these natural advantages impinges on the privacy and quiet of the residents.
8. Supply of vacant apartment sites which are likely to be built upon; their potential effect on present accommodations will be to make them either more or less desirable
9. Sufficient parking for tenants and guests
10. Economic status of tenants
11. Amount of vacancy and tenant turnover rate.

This and other pertinent data form the background for the appraiser's study of rental housing property. In some cities, statistics are available concerning the supply of apartments, vacancy,

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* American Institute of Real Estate Appraisers, *Appraisal Terminology and Handbook* (5th ed., Chicago: Author, 1967), p. 90.

♦ *Op. cit.*, p. 46.

◊ *Op. cit.*, p. 42.

▲ *Underwriting Procedures, FHA Manual* (HUD), Government Printing Office, Washington, D.C., 1934– (looseleaf), periodically updated with supplements.

and rent levels. Where statistics are not available, the appraiser may make his own survey of the area.

Analyzing the Commercial District

The commercial district and its property values are influenced by the factors which affect the value of the residential property surrounding it. In appraising a commercial property, then, the neighborhood is defined as the grouping of stores, plus the area which the stores serve.

Is the store district purely a local grouping along a business street or freeway service road? Is it a development adjacent to a public transportation intersection? Is it a regional or neighborhood center, or is it the downtown central business district? Depending upon the type, the appraiser will seek answers to various questions, although his primary concern will be the competitive outlook. Nowhere does the principle of change have greater application.

In the analysis of the commercial district, the emphasis is on the quantity and quality of purchasing power available to the shopping area.

Desirability and value are also influenced by:

1. The 100% location or core of the grouping of stores
2. The direction of visible growth
3. Enterprise of retailers; their investment in inventory and leasehold improvements
4. Availability of land for new stores and customer parking
5. Character and location of competition, existing or anticipated
6. Economic status of the trading area, and the position in the life cycle of the contributing residential neighborhood.

When analyzing strung-out local retail groupings, the appraiser also examines the zoning policies which govern the supply of competing sites. He studies the reasons for vacancy and business failure; and he considers the level of rents in comparison with current rent levels for stores in new buildings. Certain types of

business, such as delicatessens, repair shops, service establishments, taverns, and service stations, continue to prosper despite present or prospective competition.

Commercial establishments located at transfer points have been adversely affected by the increasing use of the automobile and the decline in use of public transportation. This does not mean that every such commercial group is in a state of decay. Where surrounded by well-developed apartment neighborhoods, business may continue to prosper. Business from these areas has been lost chiefly to regional and neighborhood centers with adequate parking space.

The Central Downtown Districts

In past censuses of business,[△] the central downtown districts have been studied in a number of large cities. The general pattern shows a tendency toward fewer stores, and less increase in sales than for the metropolitan area as a whole. Downtown interests endeavor to counteract this trend of retail decentralization, usually through improved public transportation, more parking, better access, and coordinated sales promotion programs. The downtown district embraces more than just retail trade. Offices, wholesale uses, and entertainment may be additional balancing influences. The appraiser makes a point of understanding the direction of downtown trends by studying available factual data.

The Regional Center

The regional center, with an extensive parking facility and from 40 to more than 100 stores, constitutes a quite different category of commercial neighborhood. The major tenants consist of one or more department stores offering a full range of merchandise. The emphasis is on apparel stores; nevertheless, balance is usually achieved by including all the kinds of stores found in the neighborhood center. In addition there may be banks, service establishments; medical, dental, and business offices; and some-

△ U.S. Department of Commerce, *Survey of Current Business* (Washington, D.C.: monthly). Its biennial supplement is *Business Statistics*.

times a theatre. The trade area for a regional center may include several neighborhood centers. Despite competition for certain segments of economic support, neighborhood centers provide services to their immediate areas and may be considered supplementary to, rather than competitive with, the major shopping services provided by the large regional center.

Although he may not be engaged in the valuation of a neighborhood or regional shopping center, the appraiser notices their impact upon the value of other types of retail business property. Also he recognizes that they generally affect adjacent land advantageously by creating a demand for satellite stores, office building sites, and new single- or multiple-family residential developments.

The Neighborhood Shopping Center

In most localities there is a steady demand for the neighborhood shopping center, which typically includes 10 to 30 stores with parking. It has been built in great numbers since World War II. The success of this center is keyed primarily to supermarkets, drug stores, variety stores, and service establishments. Depending on size, there is a balance among the types of merchants to provide for day-to-day needs of the customer. The emphasis is on adequate parking, although public transportation and a favorable location are important factors. If a branch of a major department store is part of the complex, its category is more important than that of a neighborhood shopping center. The in-between size, usually called a community center, may suffer from being too small to compete with the big regional center and too large for the neighborhood to support.

In any such development, care is essential in making a feasibility study or marketing survey. Helpful statistics may be found in various publications.□ Business and population census data form the basis for statistics such as the disposable income per family in

□ *Sales Management*, a periodical with a special annual edition called "The Survey of Buying Power"; also *Editor and Publisher Market Guide* (Editor and Publisher, New York, N.Y.: annually).

a trading area, and how this income is divided between food, general merchandise, automobiles, and other classifications. Such information is essential to the appraiser in gauging the amount of business which a trading area will support. However, the available business still must be allocated among competing centers of trade. Patterns of customer buying are studied carefully by analysts employed by the major chain stores.

Other Retail Groupings

A study of the history of business districts makes it clear that there is a constant shifting in a dynamic economy. A business district may expand and encroach upon land devoted to other uses when the community and its surrounding area are growing. An entire business district almost literally may leap to an entirely different location if it lacks room for expansion. A district may shift in one direction, leaving the opposite direction virtually stranded. Such a shift is usually in the direction of the better residential sections of the community where the purchasing power of the inhabitants is highest. The stranded area eventually will drift into a less profitable use.

Analyzing the Industrial District

Values of land and buildings in an industrial district are influenced by such considerations as the character of the district, the available labor supply, the adequacy of transportation, the economy of bringing in raw material and of distributing finished products, the political climate, and the availability of utilities. In order to arrive at an informed conclusion as to the value of any industrial property, the data pertinent to these categories should be obtained.

Characteristics of the Industrial District

Industrial districts vary from those uses comprised of heavy industry, such as steel plants, foundries, chemicals, to those where typical uses are assembly or other "clean" operations. In most

urban areas, heavy- to light-use districts are established by zoning ordinances, which may limit not only uses but also air pollution, noise levels, and the operations that may be carried on outside of buildings.

So-called manufacturing or warehouse districts vary from older districts where typical units are obsolete multi-story elevator buildings, with limited parking and expansion area, to the newer type industrial districts and parks with modern one-story buildings. In each such district there tends to be a value pattern reflective of the reaction of the market to its location and the character of sites and improvements. For example, the market for older multi-story buildings tends to stabilize at a certain price per square foot of gross floor area, rather than at their physically depreciated reproduction cost. Similarly prices for modern one-story buildings in a good district tend to be influenced by replacement cost.

An important item influencing land value in industrial districts is the availability of public utilities including sanitary and storm sewers and municipal (or well) water. Prevailing levels of real estate and personal property taxes also influence desirability which is reflected in real estate values.

Availability of Labor

No industrial district is desirable unless there is an adequate labor supply available in the categories required by its manufacturing plants. Labor requirements of plants vary from unskilled to semi-skilled and lower management and supervisory levels. The dependence of industry upon an adequate labor supply of a suitable character frequently is the reason that these districts are located close to the residential areas of the workers. Often special inducements, such as a company cafeteria and other employee facilities, or social programs of the company are provided to attract employees to a particular plant. The park-like atmosphere of the plant with landscaped grounds may be an inducement to prospective employees. A study of the available labor supply is a necessary step in the analysis of a particular industrial district.

Availability of Materials—Distribution Facilities

Manufacturing operations require a convenient and economic source of raw or semi-finished materials, and facilities for convenient and economic distribution of their manufactured products. Depending on the type of product, the desirability of a district or a site is influenced by means of access to their unprocessed raw material, or other items, and the available means of delivery of their finished product to their customers. The standards of adequacy and acceptable economy of shipment facilities by air, rail, motor truck, or waterway vary with size, weight, character, and distance of shipment. For example, compared with heavy products, small electrical components for automobiles or television sets may be more economically shipped for long distances.

Farm Neighborhood

In the same way that a neighborhood is described as being a homogeneous area, so some farm neighborhoods can be defined as extending over several counties. The type of soil, the crops grown, or the typical land use usually helps to define the extent of the neighborhood; so do the size of the typical farm operation, and whether it is run by owner or tenant.

Grain farm neighborhoods usually are characterized by soil types and topography conducive to the growing and harvesting of corn, wheat, and other grain crops. Orchards are another type of farming in which the soil and climate combine to create a distinct economy. Areas which are not capable of producing cash crops may be adapted to production of particular grasses. The boundaries of these areas are related to altitude and climate. Generally these grass lands are used for livestock production. Dairy neighborhoods are located where the soil type is best adapted for the production of pasture grasses and hay. These areas are traversed by good highways leading to primary marketing centers for the farm's products. As in any neighborhood, the standard of the farm community is dependent upon government

services such as roads and schools, availability of utilities, and proximity to churches, markets, and shopping centers.

Summary

A neighborhood may be a segment of a city, town, or village, or it may be an entire community. Its character may be residential, commercial, industrial, or agricultural.

In the analysis of neighborhoods—whether for private dwellings, apartments, commerce, industry, or farming—many factors are pertinent. They include population growth, economic status, occupations, social interests, prestige, transportation, schools, churches, road pattern, employment opportunities, and business centers. There is a difference in the emphasis on the applicability of each factor, depending on the type of neighborhood being analyzed.

Neighborhoods are not fixed in characteristics. They are always changing, some very slowly, others rapidly. Such neighborhood changes affect the utility of parcels of land and the improvements thereon. Because a property is an integral part of a neighborhood, its value is affected by shifts in the economic, social, and physical forces creating the environment. In some instances utility is increased, whereas in others it is decreased, resulting in changes in value. The appraisal process, in arriving at a well reasoned and credible conclusion of the value of a property, should include an analysis of the effect of the neighborhood and neighborhood trends.

CHAPTER SEVEN

Site Analysis

The basic principles of real property value apply to site valuation. A site's potential utility is measured in terms of the income imputable to it after the other agents in production have been satisfied. This surplus productivity is attributed to the land. The greater the surplus, the higher is the value. The principle of substitution also is applicable because the value of the site tends to be set by the price at which an equally desirable substitute parcel can be purchased.

In estimating the value of improved real estate, the appraiser analyzes two distinct entities. One of these is land; the other is the improvements on the land. Although the two are joined physically, it is often desirable and necessary to value the land separately. The buildings and other improvements are subject to deterioration; they are a wasting asset. The value of the land may appreciate or depreciate, but it is assumed to persist indefinitely.

Purpose of Site Valuation

Separate valuations of the site may be required for specific purposes, such as:

1. Local tax assessments
2. Estimation of building depreciation
3. Application of appraisal techniques
4. Establishment of lease rentals
5. Condemnation appraising
6. Estimate of casualty loss
7. Valuation of agricultural land.

Local Tax Assessments

In many sections of the country, local ad valorem real estate tax laws require that land and buildings be valued separately in order to achieve assessment uniformity. Special assessments for public improvements, such as streets, water lines, and sewers, are levied, frequently based on their probable effect on land values.

Estimation of Depreciation

Under federal income tax regulations, the owner of an improved property can provide for an annual expense deduction to cover estimated depreciation only on the improvements. Accordingly, for this purpose the owner must allocate the original cost of an acquired property between land and improvements.

Site valuation is useful in estimating the degree of economic obsolescence of existing improvements. Assume, for example, that an analysis reveals that the highest and best use is as a store location, and that the value of the land for this purpose is $100,000. Suppose further that the land now is improved with an apartment building, but that the value of the entire property, improvements included, based on the net income from the apartments is only $75,000. It is apparent that the site is not being put to its highest and best use, and that the apartment structure is an underimprovement with little—or negative—value.

Assume a case where the obsolescence is less severe. Suppose the improvement were a store and apartment building which, on a $80,000 parcel of land, would be worth $400,000. The valuation would be divided:

Land value	$ 80,000
Depreciated building value	320,000
Total	$400,000

If located on a parcel of land which would be worth $200,000 when developed to its highest and best use, the above building would be a misplaced improvement, partially obsolete but still joined with the land for years to come.

In applying the cost approach, the total value of the property is still only $400,000. However, as the value of the land is $200,000, the depreciated value of the building based on reproduction cost less depreciation (physical, functional, and economic) represents the difference, and a separate valuation for the land is basic. It is shown thus:

Land value	$200,000
Depreciated building value	200,000
Total	$400,000

Application of Appraisal Techniques

Separate site valuation is important in applying the building residual technique in the income approach to value. In this technique, a reasonable rate of return on the land value is deducted from the net income earned by the total property. Hence a separate land value is needed.

A separate land value may be required also where properties subject to long-term leases are involved, and it is necessary to project what the land may be worth at the end of the building's useful life or at the end of the long-term lease. In such circumstances, this projected value is usually considered equivalent to the present value unless there are definite reasons for an assumption that the land value will either increase or decrease during the projection period.

Establishment of Lease Rentals

Ground rentals under long- or short-term leases are generally based on a relationship to the land value, and hence, an estimate of land value is usually a prerequisite for establishing the rental figure.

Condemnation Appraising

In some states, appraisals made for condemnation purposes require that land and buildings be appraised as a unit without

separation. In others, testimony as to separated values of land and improvements is expected.

Estimate of Casualty Loss

In the case of the destruction of the improvements by fire, a separate value of the land and the buildings may be required to establish the value of the improvements destroyed.

Valuation of Agricultural Land

In agricultural property the value of the land usually predominates. Unless there are unusual circumstances, the value of the buildings depends on their utility and contribution to the productivity of the land.

Site Data Requirements

An adequate site study requires that pertinent types of data be assembled and considered.

Title and Record Data

Essential facts include data relating to taxes, special assessments, zoning, restrictions, easements, other pertinent legal matters, and the legal description of the property.

Taxes. Taxes are intended to pay for services which make ownership more desirable. But net benefits obviously decrease when taxes are out of proportion to income. Therefore the appraiser compares the tax status—assessed values, tax rates, and tax burdens —with that of competitive or comparable sites.

In some communities the assessed value of land for taxes bears a reasonable relation to market value, particularly when a recent reassessment has been made. But in other communities the assessed value does not have a realistic relation to value.

Unit-foot depth and corner premium tables are often used to establish uniformity between assessments in valuations made by

assessors for tax purposes. The purpose of such tables is to express equivalent values for one foot of frontage applicable to sites of varying depth. The standard area of land represented has one foot of frontage, in a uniform lot width, and a specified depth. For a lot of any stated type or location, this standard depth is established. It originally was fixed in most localities at 100 feet. Depth tables should vary for different types of property.

If the adopted standard depth is 100 feet, then a lot 50-by-100 feet and worth $2,175 would have a unit-front-foot value of $43.50. Another lot, 50 feet wide with a depth of 150 feet, might be worth $2,500, or $50 per front foot, with the same unit-front-foot value of $43.50; that is, it would be equivalent in value to $43.50 per front foot for a depth of 100 feet, times a depth factor of 115%. The percentages are designed to provide a uniform system of measuring the additional value which accrues because of added depth.

It must be emphasized that depth tables are neither universally applicable nor infallible. The validity of any depth or corner table as indicating the effect of depth on value is dependent on its applicability to each location, situation, or type of use. A depth table developed to apply to conditions in one city may not apply to conditions existing in another city. Since real estate is a local product, its value is founded on local conditions and usage.

One of the first depth rules was the 4-3-2-1 rule. This is meant to indicate that the front quarter of a lot contributes 40% of the value; the second quarter, 30%; the third quarter, 20%; and the fourth or rear quarter, 10%. As this left too wide a margin for assessment purposes, the deficiency usually has been overcome by the establishment of more specific depth tables expressed in percentages for every foot, or at least for every 10 feet of depth, in order to reflect the conditions applicable in a certain locality, or to certain types of property (residential, business, industrial, commercial).

Similarly, corner influence (premium) tables have been developed for ad valorem tax purposes, in order to establish the

amount by which the market value per unit foot of an inside lot is increased for a lot with a corner location. Such tables are also related to localities and types of land for which they are prepared.

Both depth and corner premium tables have their most practical use in mass appraising, for local ad valorem tax purposes.* The objective of such tables is to approximate the effect of depth and corner influence on the value of specific sites in a *mass* appraisal project, in order to arrive at value estimates approximating those obtainable by individual appraisal of any single property in the class to which these tables are applied. Consequently, it is much more difficult to value a single property by the use of the averages inherent in depth and corner tables than specifically to appraise the effect of depth and corner influence on the utility of that same property.

Special Assessments. Unlike general property taxes, these apply only to specific districts and only for definite periods. Sometimes a property falls under the jurisdiction of several districts, each of which has the power to levy special assessments. Thus a property could be inequitably burdened and consequently lose desirability. However, special assessments actually are installment payments for improvements such as streets and utilities which usually enhance the value of a site. A site so encumbered could be valued subject to the payment of the remaining installments; or the amount of the remaining special assessment installments could be deducted from the value estimate derived from comparable sites which are free of such liens.

Such special assessments are often computed similarly to valuation for ad valorem tax purposes. They are usually based on the relative benefits (increase in value) anticipated as a result of the influence of the special assessments upon the value of the various properties.

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* Mass appraisal, such as a uniform system of valuation for local real estate tax assessment purposes. See Walter R. Kuehnle, *Valuation of Real Estate for Ad Valorem Tax Purposes* (Chicago: Author, 1954), p. 16.

Zoning. Zoning is a legally imposed restriction upon the uses of a site. But a site's highest and best use may not necessarily be any of the uses designated by a zoning ordinance.

Changes in uses permitted by zoning may substantially increase or decrease the value of the property in accordance with the permitted use. Properties are frequently bought and sold subject to the success of obtaining a zoning change, such as residential to more intensive apartment use, or residential to industrial or business use.

Sometimes zoning changes, in creating a condition of monopoly, allow the older, non-conforming properties a site utilization with which new buildings cannot compete. Over the last half-century there has been a trend to reduce the percentage of the lot which the building is permitted to occupy. Thus sites with buildings constructed in the past, under more liberal land coverage provisions, may give these sites a monopoly value for the life of the existing improvements. This is disclosed by examination of the latest zoning maps and zoning ordinances. Citations from these are often included in appraisal reports to substantiate the appraiser's interpretation of permissible usages. Sometimes a legal interpretation may be required. Differences of value opinion in court may have their source in misunderstanding of permissible use under the terms of a zoning ordinance.

When more land is allocated to one kind of use than is economically sound, the principle of balance is violated and the potential value of the land may be adversely affected.

Restrictions and Easements. There are two kinds of restrictions: public and private. Public restrictions (in addition to zoning ordinances) are those imposed by law. They include limitations set by fire ordinances; building, plumbing, and sanitation codes; housing acts; and other legislative enactments. Public restrictions usually are not as stringent as private restrictions, although both deal with essentially the same matters. Both are concerned with permissible building uses, and designate the permitted type of

building materials, building heights and volume, ground coverage by buildings, and setback lines.

When legal private and public restrictions conflict, the more stringent prevails. For instance, if public zoning regulation permits only single-family homes, and private agreements permit business, then the latter are nullified by the former.

Private restrictions are limitations of a contractual nature. They are usually imposed by the deeds used to convey title. Sometimes they are imposed by means of a general plan of restriction for an entire tract recorded by the developer of the land. Then, whenever a lot is deeded to a purchaser, the deed provides for the title to be conveyed subject to the recorded restrictions. Legal private restrictions are of greatest significance when there are no public controls.

Title reports are the usual source of data concerning private restrictions. Recorded deeds may mention that restrictions are imposed, but usually do not specify them.

Reservations retained by grantors in the chain of title, such as easements upon and rights of way across a property, restrict the rights of subsequent owners. An easement for ingress and egress in favor of parties other than the owner may decrease a property's utility and value. However, there may exist an easement attaching to adjacent property which is beneficial to ownership of a subject property. Rights of way, party-wall agreements, and other agreements which run with the land can either restrict or enhance the land's utility and value.

Restrictions and easements which affect property rights may be contracts which bind only the contracting parties, rather than covenants which run with the land and bind all parties in the subsequent chain of title.

An estimate of the value of an easement or right of way independent of the fee title to the land, is an appraisal of one or more but not all of the (bundle of) rights constituting the entire property. Depending upon how comprehensive are the rights included,

the value of an easement may range from a small percentage of the value of the easement area to the value of the whole. There may be additional value loss to adjacent land in the same ownership owing to creation of the easement. Pipelines, electric transmission lines, cable lines, railroad rights of way, airport approach patterns, avigation easements, and often roadways are examples of easement ownerships which involve substantial interests in the bundle of rights of the land they traverse.

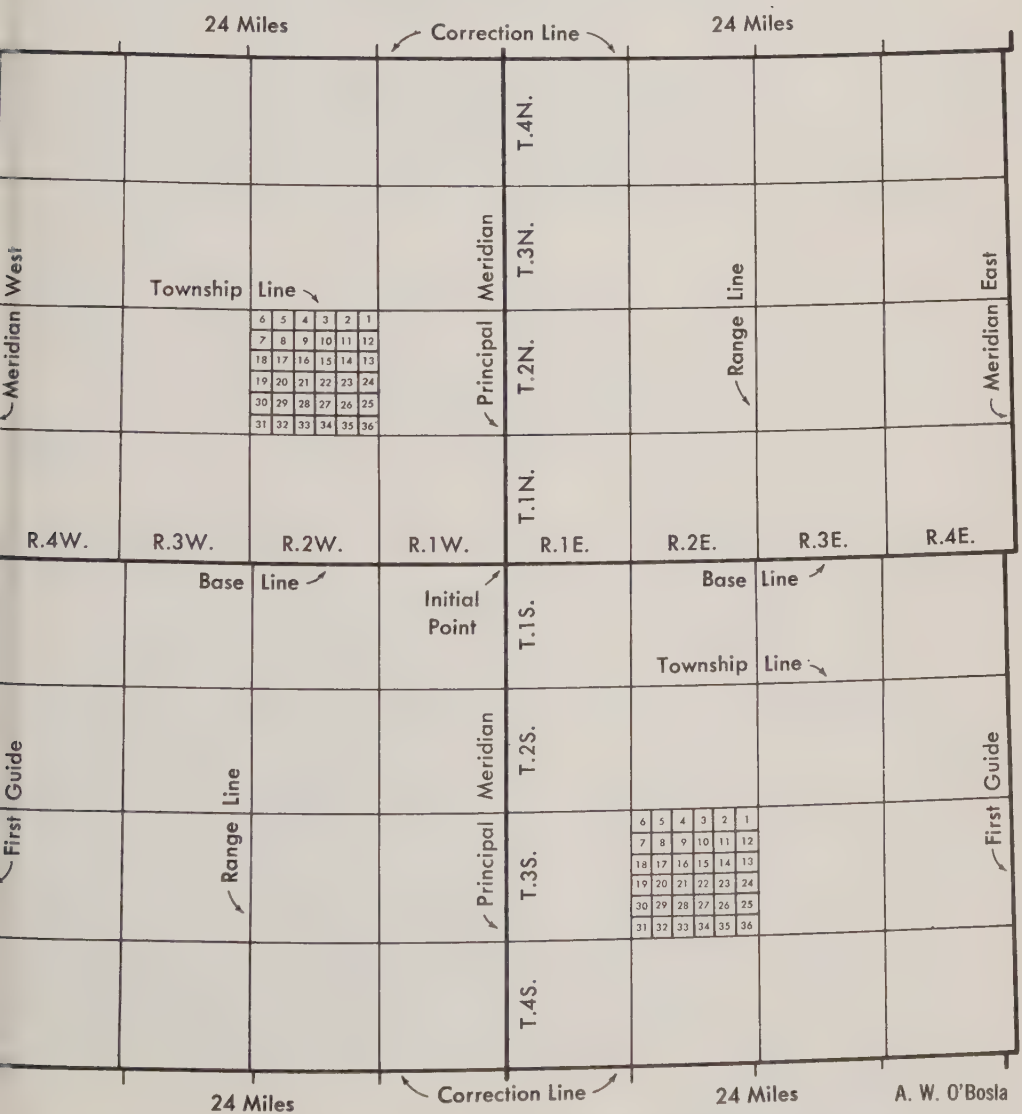
Legal Description. The legal description identifies a property in such terms that it cannot be confused with any other parcel. Explained in the next few pages are several systems of legal description that have long been in use.

Government Survey System. This rectangular system resulted from the work of a committee headed by Thomas Jefferson and was adopted by the Continental Congress in 1785. This plan, dividing the land into a series of rectangles, provided only for townships six miles square. Since these areas proved too large, Congress passed an act in 1796 directing that these townships be divided into 36 sections. In 1800 Congress passed an act directing the subdivision of sections into halves. By the Act of February 11, 1805, Congress further provided for division into quarter sections. Not until 1820 did Congress, by another Act, provide for half-quarter sections, and finally in 1832 Congress directed the subdivision of all public lands into quarter-quarter sections (40 acres), the smallest statutory division of regular sections.

The government—or rectangular—survey system ideally provides for a unit of land approximately 24 miles square, bounded by base lines running east and west, and meridians extending north and south, as shown on the accompanying diagram, Government Survey System. The north boundary of the square is slightly shorter than the south boundary because the east and west boundary lines are true meridians of the earth and thus tend to converge toward the north in this hemisphere. The 24-mile-square unit is divided into areas six miles square, called townships. A tier is an east-and-west row of townships between two parallels of latitude six miles apart. A range is a north-and-south row of townships between two meridian lines also six miles apart. Ranges and tiers are assigned numbers from principal meridians and base lines. A township is divided into 36 sections, each one mile square.

The sections are numbered consecutively beginning with the section at the northeast corner of each township and continuing west to the northwest corner. Then the sequence of numbers drops down one row and returns eastward. This process continues—east to west and west to east—until the entire township is numbered, with Section 36 in the southeast corner. As mentioned above, the town-

GOVERNMENT SURVEY SYSTEM



Source: John S. Hoag, *Fundamentals of Land Measurement* (Chicago: Chicago Title Insurance Company, n.d.).

ship's northern boundary is not exactly six miles in length because of the convergence of the meridians. This discrepancy, and others due to errors in measurement or alignment, are allowed for in the most westerly half mile of the township. Shortages or overages in acreage of sections thus are usually found on the west and north sides of townships. Fractional sections also resulted when they were bounded or bisected by navigable waters. The diagram, Division of a Section of Land, illustrates the scheme of the government survey system. (See page 120 for Units of Measurements)

Division of a Section of Land

One Mile = 320 Rods = 80 Chains = 5,280 Feet

<table>
<tr><td>20 Chains - 80 Rods

W½ N.W¼
80 Acres

1320 Ft.</td><td>20 Chains - 80 Rods

E½ N.W¼
80 Acres

1320 Ft.</td><td colspan="4">40 Chains - 160 Rods

N.E¼
160 Acres

2640 Ft.</td></tr>
<tr><td rowspan="2">N.W¼ S.W¼
40 Acres</td><td rowspan="2">N.E¼ S.W¼
40 Acres</td><td colspan="2">N½ N.W¼ S.E¼
20 Acres</td><td rowspan="2">W½
N.E¼
S.E¼

20 Acres
10 Chains</td><td rowspan="2">E½
N.E¼
S.E¼

20 Acres
10 Chains</td></tr>
<tr><td colspan="2">S½ N.W¼ S.E¼
20 Acres
20 Chains</td></tr>
<tr><td rowspan="3">S.W¼ S.W¼
40 Acres

80 Rods</td><td rowspan="3">S.E¼ S.W¼
40 Acres

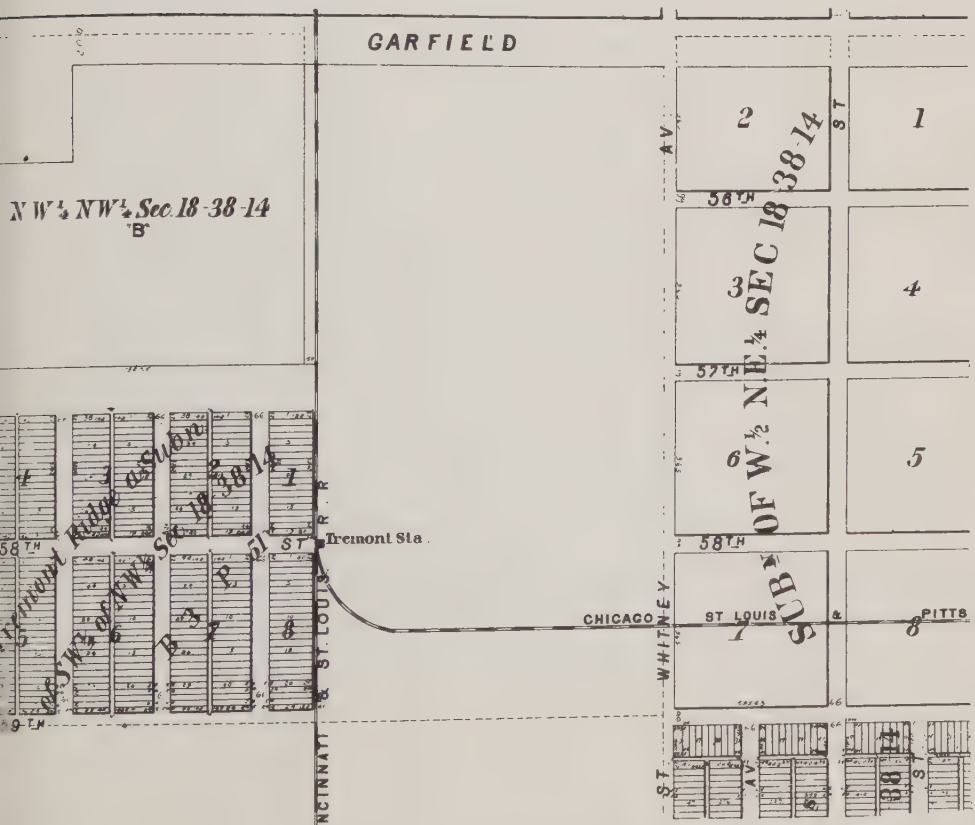
440 Yards</td><td>N.W¼
S.W¼
S.E¼
10 Acres</td><td>N.E¼
S.W¼
S.E¼
10 Acres</td><td>5 Acres
5 Acres
1 Furlong</td><td>5
Acres
5 Chs.</td><td>5
Acres
20 Rd.</td></tr>
<tr><td>S.W¼
S.W¼
S.E¼
10 Acres
660 Ft.</td><td>S.E¼
S.W¼
S.E¼
10 Acres
660 Ft.</td><td>2½
Acrs
2½
Acrs
330 Ft</td><td>2½
Acrs
2½
Acrs
330 Ft</td><td colspan="2">10 Acres may be subdivided into about 80 lots of 30'x125' Each</td></tr>
</table>

Courtesy of Chicago Real Estate Index Co.

Lot and Block System. This system, derived from the rectangular survey system, applies in most urban communities. It originated in the manner in which these communities grew. The early land developers had their tracts surveyed and platted in rectangular blocks and lots. Each block and lot was then numbered for identification and these numbers entered on the plat map of the tract. Copies of this plat were filed in the county recorder's office for permanent reference. The lot and block system is simple and convenient. An example reads:

> Lots 23 and 24 in Block 8 in Tremont Ridge, a Subdivision of the Southwest Quarter of the Northwest Quarter of Section 18, Township 38 North, Range 14, East of the Third Principal Meridian in Cook County, Illinois.

Sec. 18, T. 38, R. 14.



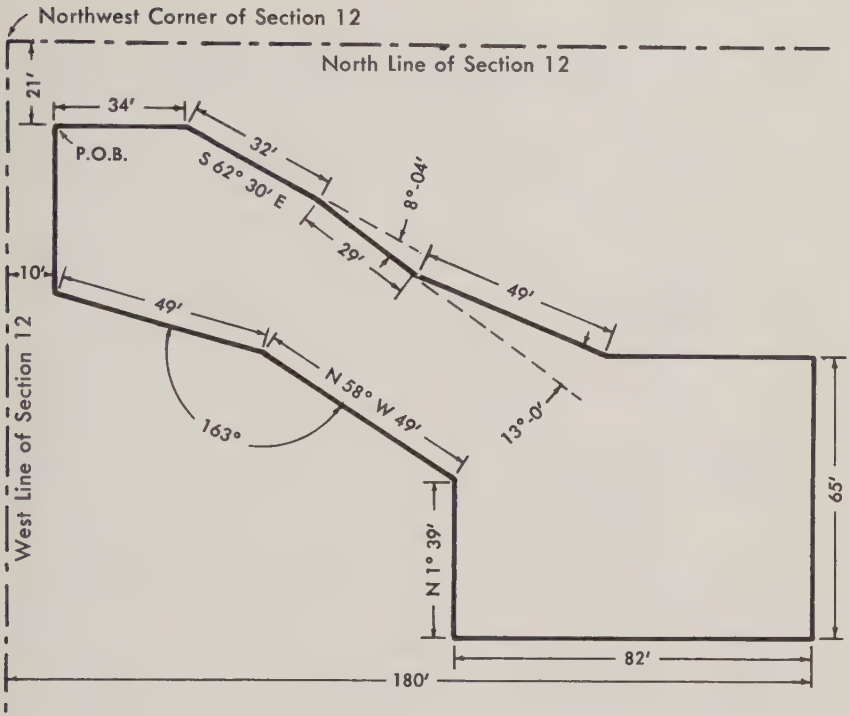
Units of Measurements:	
1 Link is 7.92 inches.	1 Mile is 8 furlongs, 320 rods, 80 chains or 5,280 feet.
1 Foot is 12 inches.	1 Square rod is 272¼ square feet or 30¼ square yards.
1 Yard is 3 feet or 36 inches.	1 Acre contains 43,560 square feet.
1 Rod is 16½ feet, 5½ yards or 25 links.	1 Acre contains 160 square rods.
1 Chain is 66 feet or 4 rods or 100 links.	1 Acre is about 8 rods by 20 rods long, or any two numbers (of rods) with a product of 160.
1 Furlong is 660 feet or 40 rods.	1 Acre may be divided into about 8 lots 30 × 125 feet.

Metes and Bounds System. This system identifies a property by delineating its boundaries in terms of a series of directions and distances from an identified initial point or place of beginning. Followed in many parts of the world, this system was introduced into the original thirteen colonies and the southern states. Still widely encountered in the United States, it was in general use prior to the introduction of the government survey system.

Landmarks, such as fixed features of landscapes and "witness trees," were originally used as points of reference in the metes and bounds system. A custom introduced from Europe, reportedly often used in colonial days, was that of the witness or "flogging fee." A young boy was given a fee to be taken to the witness tree to submit to a sound thrashing in the presence of an assembled group. While the efficiency of this method may be open to question, the theory was that during his entire life, he would never forget the location of that landmark. The metes and bounds system, which may also be used with the government survey system or the lot and block system, is illustrated below.

If the parcel is not situated in a recorded subdivision, as frequently occurs in non-urban areas, a point of beginning must first be established. This may be accomplished as shown in the following, by relating it to the government survey system. The parcel is then specifically identified by a metes and bounds description which starts from this point and, following the boundaries of the property, returns to conclude at this point. Such a survey is referred to as a traverse and, when encountered, it should be checked to ascertain that it does, in fact, "close" by returning to the point of beginning.

ILLUSTRATION OF METES AND BOUNDS SYSTEM



Description of Tract:

Commencing at the Northwest corner of Section 12, thence South along the section line 21 feet; thence East 10 feet for a place of beginning: thence continuing East 34 feet; thence South 62 degrees, 30 minutes East 32 feet; thence Southeasterly along a line forming an angle of 8 degrees, 04 minutes to the right with a prolongation of the last described course 29 feet; thence South 13 degrees, 0 minutes to the left with a prolongation of the last described line a distance of 49 feet; thence East to a line parallel with the West line of said Section and 180 feet distant therefrom; thence South on the last described line a distance of 65 feet; thence due West a distance of 82 feet; thence North 1 degree West 39 feet; thence North 58 degrees West a distance of 49 feet; thence Northwesterly along a line forming an angle of 163 degrees as measured from right to left with the last described line a distance of 49 feet; thence North to the place of beginning.

Mapped, edited, and published by the Geological Survey
Control by USGS and USC&GS

Topography by photogrammetric methods from aerial photographs taken 1958. Field checked 1960

Polyconic projection. 1927 North American datum
10,000-foot grid based on Illinois coordinate system, east zone

This Map Complies with National Map Accuracy Standards
For Sale by U.S. Geological Survey, Washington, D.C.
And by the State Geological Survey, Urbana, Illinois

A Folder Describing Topographic Maps and Symbols is Available on Request

Reduced from original scale 1:24,000
Contour Interval 10 Feet
Dotted Lines Represent 5-Foot Contours
Datum is Mean Sea Level

APPROXIMATE MEAN
DECLINATION, 1960

Geodetic Survey System. Another method of land survey is the United States Coast and Geodetic Survey System. It was initiated to identify tracts of land owned by the federal government, but gradually has been extended throughout the nation. These survey maps are prepared by the United States Geological Survey Division, Department of the Interior. They show, among other things, height contours, latitude and longitude, existing rivers and streams, buildings and railroads. These printed maps are available on various scales by named quadrangles.

This system is as exact as the science of measurement can reasonably achieve, and it integrates all real estate in the country into one unified system. The skeleton of this method is a network of "bench marks" which cover the entire country. Each is located by its latitude and longitude.

Relation of Site to Land Pattern

Analysis of a site is not completed without careful examination of its relationship to the surrounding land-use patterns. This requires a study of the influence of such factors as abutting and nearby streets, adjoining lots, alleys, orientation, and traffic conditions.

Although the utility of a site is affected by forces and factors external to the site itself, the site's physical character may prevent its highest and best use. It is important to accumulate and analyze data about physical facts such as: the site's width and frontage, depth, shape, area, topography, topsoil and subsoil, landscaping, and relationship to the pattern of neighboring land use, including contiguous sites, streets, and alleys.

Abutting Lots

The gridiron pattern of most cities may cause one side of a lot to abut on the rear lines of another. In such cases when all adjoining lots are improved with structures, the view from the abutting side is of backyards and garages. This usually results in decreased value.

The gridiron pattern also used alleys to separate rows of residential lots on opposite streets. Sometimes an alley may be laid out between a row of homes on one street and a row of store

properties on another. Good residential development avoids such situations.

Width and Frontage

Although these terms are often used synonymously, their meanings differ. Width is the distance between the side lines and may vary at different distances from the front, as in the case of a triangular lot. A lot that is wider than another may possess greater usefulness and value because a larger building or several types of buildings may be erected upon it. Width alone, however, does not indicate the presence of utility. Without proper depth a site may not have sufficient area upon which to build a satisfactory structure. Units of land measurement which relate to width alone are not adequate and may be misleading. The "front foot" is such a unit. It conveys nothing about depth or width at points away from the front line. Nevertheless, the front foot is a useful unit for making comparisons between sites, if its limitations are recognized.

Frontage refers to the length of the boundary which abuts the thoroughfare that a lot faces. Frontage frequently is more important than width, because the extent of the footage at the street line gives a good indication of prominence and accessibility from the street.

In practice, comparisons made in site analysis include both frontage and area.

Sometimes greater width results in decreased unit value. In an area where residential sites typically are 50 feet in width and frontage and worth $100 per front foot, an 80-foot lot might be worth only $6,400, or $80 a front foot. The reason for this is that the utility of the wider lot is not proportionately greater than that of the typical lot. Added width is accompanied by increased taxes and cost of maintenance without proportionately increased desirability or income-producing possibilities. Similarly, a 35-foot lot in the same district might be worth $2,625, or $75 per front foot, because it does not offer sufficient area to accommodate a building typical for the neighborhood.

To a certain extent, utility varies in direct proportion to width, if the width is uniform through the depth of the lot. Value varies in a like manner. However, simply because one lot is twice as wide as another does not mean that its value is twice as great even though the depth may be the same in each case. Certain widths are more adaptable to buildings intended for certain purposes. For example, a narrow lot may not be well adapted for use as an apartment site. A lot which is suitable for this use might be worth three or four times as much per foot of width or frontage, even though it is only twice as wide as the narrow lot. Similarly, the wide lot might be worth more than the combined value of two or more lots which, taken together, equal it in width, assuming that the smaller lots were in the hands of different owners. As separate lots, the smaller parcels might be worth $100 per front foot, but when combined in one parcel, the front foot value might be $150. This increment in unit value is called plottage value, which reflects the potential for a more profitable use owing to assemblage into a larger site.

Depth

Custom in different communities suggests the units to be used in estimating land value. In most large communities commercial land is valued in terms of a dollar amount per square foot. Industrial land generally is valued in terms of dollars per square foot or per acre. Single-family residential land is usually valued in terms of front feet, and apartment sites in terms of front feet, square feet, or in terms of so many dollars per (zoned) allowable dwelling unit. Land value units may follow these rules of behavior:

1. As the depth of a lot decreases from the typical, the frontage unit decreases, but the square-foot or acreage unit increases.
2. As depth increases beyond the typical, the frontage unit increases, but the square-foot or acreage unit decreases.

For an example of the first premise, assume that a commercial site 100 feet deep is valued at $1,000 per front foot. The square-foot value is $10 per square foot. Another parcel in the block has

a depth of 50 feet. After ample exposure to the market, the shallow parcel sells for $700 per front foot. The frontage unit has decreased because the depth is only half the typical depth. However, the value per square foot has increased from $10 to $14. As an example of the second premise, assume that another parcel, which is 125 feet deep, after exposure to the market sells for $1,100 per front foot. The square-foot unit has decreased from the standard $10.00 to $8.80.

Both of these rules of behavior are modified to the extent that the value of a lot is less if it is too shallow to be developed for an appropriate use. In like manner, following the principle of contribution, if the lot is too deep, the incremental value of the back land is lower.

Corner Influence

A location at the intersection of two streets may be advantageous for some uses. At an intersection of an alley, a location may also carry some advantages. A corner location usually provides more light and air, and may afford more prominence, features which could enhance value. However, a corner location may also have higher taxes because of increased street frontage. It may also be subject to more noise and more passing traffic. Whether a corner location is advantageous or disadvantageous to a site can be judged in terms of its best or intended use, and other considerations.

A corner location has greater influence on the value of a site in a business district than in other areas. Corner location is usually a positive influence for business and apartment sites, owing to increased prominence, accessibility, and special zoning advantages. However, corner location may not be a positive value influence in single-family residential lots because research indicates that there is approximately as much demand for an inside lot as for a corner lot. Because of the trend toward larger residential lots, owners of inside lots find that they, too, enjoy ample light and air, plus the advantages of more privacy, which may be insured by careful planning.

Plottage

Plottage value is defined as the increase in unit value resulting from improved utility where smaller plots are combined to form a larger one. To accommodate a substantial building development, small plots may need to be assembled, often from different owners. This procedure usually entails extra costs, and key parcels may need to be purchased for more than their independent land value either because they are already improved or because of negotiating disadvantage. After assembly, the project needs to support the excess costs of land in addition to the other capital costs involved. This has led to increased use of existing large plots in reuse areas, also air rights, railroad yards, and other undeveloped sites peripheral to central areas of large cities, as more economical sites for office-building and hotel development.

It is not the cost of assembly that creates plottage value. Size itself is no guarantee of plottage increment. For plottage value to be realized, there must be the potential of a higher and more profitable use. The whole cannot be worth more than the sum of its parts without this potential.

Area alone does not disclose all of the facts about a site's usefulness. Two lots identical in area could possess entirely different utility and value because one is 20 by 250 feet and the other is 50 by 100 feet. The latter would be the more valuable for almost any conventional improvement.

Shape

Utility is affected by lot shape. In many cases, irregularity of shape may prove to be a serious drawback. This is particularly true in commercial zones where, under existing laws, the entire ground area may be covered by a building. Because of a site's irregular shape, construction costs could run so high that it would be impractical to erect a building which otherwise would represent the best use. Irregular commercial and industrial sites might accommodate a satisfactory building erected at a practical cost, but still not provide for efficient parking, ingress-egress, or yard storage.

A site, however, could retain its utility even though it does not conform to the usual pattern of lot width and depth, if it offers sufficient area and is adequately proportioned to accommodate a single-family dwelling suitable to its surroundings.

Value of irregularly shaped parcels is usually indicated in dollars and cents per square foot of area or in dollars per acre. This may be misleading because it implies that all portions are equally useful and that every square foot is equal in value to every other square foot. This situation rarely exists. Value usually does not vary in direct proportion to depth and, sometimes, not in direct proportion to width.

Value per square foot, rather than per front foot, is applied to most industrial properties and to many types of commercial or apartment properties. But square foot comparisons may be misleading if used to make direct comparisons of sites which have different widths or depths. This also applies to front-foot values and to unit-front-foot values. The application of any comparative value unit requires individual adjustment to the shape and size of the site under consideration, particularly where the site is irregular.

Contour and Topography

Sites tend to have lower value if they are costly to improve because of topographical conditions. A lot higher or lower than the abutting street level may cause additional costs to correct poor drainage, erosion, or accessibility. Sometimes, however, difficult conditions are offset by advantages such as view or privacy.

Soil and Subsoil

The character of surface and subsoil has a definite bearing on the cost of preparing a site for building. Also, it can influence the design of the structure to be erected on the site. The cost of improvements is increased if it becomes necessary to blast, or if unstable soil or quicksand is found. Soil conditions are usually determined by an engineering study of the bearing quality of

the soil and its suitability as support for foundations or different types of structures. Extra expense is entailed for foundation walls and the sinking of piles if a site must be filled in. A sandy or rocky soil requires the expense of topsoil for lawns and landscaping. Underground tunnels could present a hazard in mining districts. Site analysis must include consideration of all such possibilities. The additional cost of the proposed improvements usually is a measure of reduced land value.

Landscaping

Trees and shrubs may be considered as improvements or simply as part of the land itself. Landscaping may be treated separately when comparing sites. The influence of these features varies with the best use of the site. Trees on a residential lot may add to its value, while trees in a tillable field to be used for cropping may be considered a liability, with the cost of their removal reflected in a lower land value.

Lawns, shrubbery, gardens, and man-made plantings in general improve the appearance and desirability of residential, commercial, or industrial properties. However, because plantings are a matter of individual taste and deteriorate rapidly without constant care, property buyers are inclined to discount the cost of replacing the plantings. Although such improvements are usually regarded as an asset, their contribution to the value of the property varies with their extent, location, and character.

Utilities

While considering the physical features, the appraiser also ascertains the availability of adequate utility connections for sewers, water, electricity, gas, and telephone. Where vacant land is involved, the proximity to, and accessibility of, utility lines of adequate capacity is highly important.

Electricity is the first requirement for raw land, in order to provide for pumping water, lighting, and other needs. Electric requirements for household appliances and industrial uses have

precise voltage and wiring specifications. Therefore the presence of electric service does not insure that the property is adequately served.

Value is influenced by the chemical content of the water, the adequacy of the pressure, and the location and cost of a waterline connection to the property.

Storm sewers must be installed to relieve damp or swampy soil conditions. Also, the water which formerly sank into the ground must be conducted elsewhere from roofs and paved surfaces. The storm sewer and the connection to it must be large enough to care for anticipated runoff. Sanitary sewage is disposed of either by septic tanks or municipal lines. The desirability of a property is influenced by the adequacy of public sewers and availability of branch connections. Otherwise, septic systems can be installed, if—and as—permitted by law, provided percolation tests indicate soil conditions are suitable.

The availability, quantity, and cost of gas for cooking, heating, hot water, and industrial uses also influence value.

Telephone connections usually are available.

Public Transportation

The need for public transportation varies with the character and demands of the highest and best use of the site.

Road patterns and automobile traffic are influences which must be considered in analyzing neighborhoods as well as in appraising the individual site. Wide roads lend prominence to their frontage, and develop consequent demand for service station locations and other uses which can capitalize on advertising display value. However, extremely heavy auto traffic can destroy that display value.

Limited access highways, one-way traffic regulations, newly located traffic signals, median strips—any of these could be influencing factors. The existence of these controls, or their anticipated existence, are reasons for the appraiser to include in his report his opinion of their potential effect upon value.

Climatic or Meteorological Conditions

In some regions these conditions may increase the value of lots that face in a certain direction. For example, if prevailing winds are consistent, lots may be favorably or adversely affected by their relation to the direction of the wind.

Local shopping habits and pedestrian traffic patterns may affect the value of store sites. For example, if shoppers tend to avoid the sunny side of the street, stores located on that side do less business. Because, consciously or subconsciously, more people avoid unnecessarily crossing heavily traveled streets, the shops located on the long side of a rectangular block usually receive the most patronage. Thus sites on the short side tend to become less desirable.

Highest and Best Use

To have value, a site must have a utility which is in demand by prospective purchasers, i.e., one which will produce amenities or net income to the user. The objective of site analysis is to gather the data which tends to indicate a site's highest and best use, and to estimate the value of the land in terms of this use.

Highest and best use may be described as that use which fully develops the site's potential.† This use may change with time and conditions. Zoning of a particular site might be for a single-family house. However, because of shifting economic and social patterns, the highest present utilization of this site might be achieved by conversion to commercial uses; or it may be possible to anticipate developments which will bring about a change in highest and best permitted use, and endow a site with future value even though there is no current demand for such use. The term also is employed to designate a program of utilization which is to

† Highest and best use is that which, at the time of appraisal, is the most profitable likely use to which a property can be put. It may also be defined as that available use and program of future utilization which produce the highest present land value. (See chapter on the Basic Principles of Real Property Value.)

produce the greatest future benefit to the owner. This may include more than one potential future use, each of which is foreseen to be the most profitable use at a stated time.

The concept of highest and best use is well established in condemnation law.‡ The power of the government to take property from a private owner is incontestable if the purpose is for public benefit. Compensation is awarded by the courts usually on the basis of market value. As a rule, the owner is allowed to establish the highest and best use of his property regardless of present use, if such potential use is reasonably probable, not speculative.§

Uses permitted by zoning regulations may be less valuable than the potential use to which the land is adapted, as previously noted. Courts customarily take the position that testimony may be heard only as to the highest and best use permitted by law at the present time. The appraiser risks being put into an equivocal position in giving testimony concerning highest and best use. Purchasers of land will sometimes pay more for a parcel for its potential use than could be supported by its legally permitted present use. Such purchasers buy in anticipation of a reasonably expected change in the permitted use. Accordingly, a market value estimate takes into account not only current zoning, but the market's estimate of the added value with the probability of a zoning change permitting the highest and best use.

Estimating the future highest and best use depends on many factors in addition to the site's physical features. These may be legal, contractual, or economic restrictions on the use of the site; or they may relate to market conditions such as supply and demand.

In making market value estimates, appraisers should limit themselves to highest and best use considerations which have a strong probability of achievement. Not every large vacant tract is a

‡ "Legal Aspects of Highest and Best Use," *Condemnation Appraisal Practice*, (2d printing 1967, Chicago: American Institute of Real Estate Appraisers), p. 25.

§ "The Meaning of Just Compensation," *op. cit.*, p. 3.

potential shopping-center site; nor is every tract along the railroad a future industrial park. Courts have held that projected highest and best use should not be "remote, speculative or conjectural."*

Summary

A site's potential utility is measured in terms of the income imputable to it after the other agents in production have been satisfied. Whereas land and building are usually appraised as a unit, separate valuation of the site may be required for appraisal, legal, and accounting purposes. An adequate site study made in connection with the valuation of a site requires the analysis and consideration of various types of data, which include:

1. Title and record data
   a. Assessed value and taxes
   b. Special assessments
   c. Zoning—classification of use, setbacks, heights, ground coverage
   d. Public restrictions—same as zoning, plus building, fire, building sanitation, and other ordinances
   e. Private restrictions—same as zoning and public restrictions
   f. Easements, such as rights of way, party-wall agreements
   g. Legal description
2. Relation to land pattern
   a. Abutting lots
   b. Width and frontage
   c. Depth
   d. Corner influence
   e. Plottage
   f. Shape
   g. Contour and topography
   h. Soil and subsoil

* McGovern v. New York, 229 U.S. 363, 57 L. Ed. 1228, 33 S. Ct. 876.
Pacific Gas & Electric Co. v. Hufford, 311 P. 2d 936.
Trunkline Gas Co. v. O'Bryan, 21 Ill. 2d 95, 171 N.E. 2d 45.
Dillenbeck v. State, 193 Misc. 542, 83 N.Y.S. ed. 308, aff'd 275 App. Div. 871, 88 N.Y.S. 2d 389.
Melton v. State, Texas, 395 S.W. 2d 426.
Muscoda Bridge Co. v. Grant County, 200 Wis. 185, 227 N.W. 863. These are merely a sample of citations.

i. Landscaping
j. Utility connections—electricity, water, storm sewer, sanitary sewer, gas, telephone
k. Public transportation
l. Traffic patterns and controls

3. Climatic and meteorological factors

4. Highest and best use
   a. Present
   b. Anticipated.

CHAPTER EIGHT

Site Valuation

THERE ARE SEVERAL procedures available to the appraiser for the valuation of land. The four basic procedures are:

1. The market data or comparative approach. This calls for appraisal by comparing, weighing, and relating sales of similar vacant sites to the land being appraised.
2. The abstraction procedure (also known as distribution or allocation) involves allocation of the appraised total value of the property between land and building. This may be accomplished either on a ratio basis or by subtracting a figure representing building value from the appraised total value of the improved property.
3. The anticipated use or development procedure. Applicable to undeveloped land, this procedure calls for estimating total value as if the land were subdivided and sold, and subtracting the development costs, incentive costs, and carrying charges.
4. Use of the land residual technique. This capitalizes into value the residual income imputable to the land as obtained with a prospective new building improvement which is a highest and best use of the site.

Market Data Approach

This approach, which is generally preferred, requires the gathering, recording, and comparing of sales data for comparable sites. The greatest weight should be placed on actual sales of similar land made at times relatively concurrent with the date of the appraisal and subject to comparable conditions. These and other facts assembled for comparison constitute the market data.

Sometimes market data is too meager to support any significant conclusions; then a study of comparable properties being offered

for sale may be helpful. However, offering prices usually have limited validity as market data because a seller can offer a property at any price, no matter how unrealistic.

The appraiser may also consider offers by prospective purchasers. These offers, however, may tend to be less than the land is worth unless the purchaser has a strong need for the site. Courts usually do not give much weight to evidence based on offers to purchase. Their reason for this attitude may be found in the definition of market value.*

Prices paid by federal or state governments or other condemnors are not usually accepted as market data, because of the possible compulsion to complete a sale when the parties face condemnation (law suit), as opposed to the willing buyer–willing seller concept in the definition of market value. The price paid may reflect market value, but may not qualify as a free market transaction under this concept.

If weight were to be given to value indications other than actual comparative sales, the testing of the material would be the same as for sales data. Accordingly, the following discussion is concentrated on comparative sales data.

Sources of Data

Market data may be obtained from many sources. These depend on the character of the property, the local methods of reporting and recording real estate transactions, and the contacts which the appraiser has developed. Completed real estate sales are shown in the public records by the recorded deeds of conveyance.

When an appraiser is not personally familiar with the details surrounding a transaction, he may become so by interviewing the grantor, the grantee, the broker, or all three. Interviews enable the appraiser to obtain firsthand information about the unrecorded conditions surrounding the sale which might have influ-

* American Institute of Real Estate Appraisers, *Appraisal Terminology and Handbook* (5th ed., Chicago: Author, 1967), p. 131.

enced either or both parties to the transaction, and to verify the sale price. Although news stories may be in error about prices, the figures they cite also serve as a starting point for market price investigation.

Qualified local opinion is a source of data which may be relevant as a background study of contemporary value. Although bankers and others who loan upon, or negotiate transactions in, real estate are not appraisers in the professional sense, their views, when properly interpreted, reflect market opinion on questions of value.

Market data may be found in the public records—transfer maps or books, the index of deeds and the deeds themselves. From these it is possible to obtain certain pertinent information, including:

1. Name of the grantor (seller)
2. Name of the grantee (purchaser)
3. Date of sale
4. Legal description, to identify location, to verify size and shape
5. Stated consideration (may be a nominal figure)
6. Encumbrances (usually taxes not due and payable, zoning ordinances, and restrictions of record)
7. Mortgage indebtedness (if assumed by purchaser)
8. Sale price as indicated by tax stamps, if the state has a law requiring that stamps be affixed to the deed to cover the tax at a certain rate on the consideration. The "actual consideration" indicated by tax stamps attached to the deed may have been deliberately overstated or inaccurate. In trades, the indicated consideration may not represent value in the minds of buyer and seller. However, the price inferred from tax stamps is a starting point which requires verification.

Court opinions differ concerning the point at which knowledge begins and hearsay ends. In some places, the price must be verified by testimony of grantor, grantee, or both. In other courts, the statement of the broker is sufficient. In work which is not destined for court, the appraiser may rely on the average accuracy of many transactions where the prices are indicated by tax stamps. The number of these comparisons involved in a specific assignment depends upon the number needed to convince the appraiser that he has achieved a reliable indication of value.

Analysis of Data

Information assembled on numerous sales of land in the general vicinity of the site being appraised is of limited value if it is presented simply as a list of transactions. The sales listed should be classified and analyzed in terms of similarity to, and differences from, the property being appraised, so that the relevant transactions can be segregated for further study.

Although legal interpretations vary in different states, most courts require that a comparative transaction meet four tests: the sale must be voluntary, bona fide, similar to the property being appraised in physical and locational characteristics, and recent. Accordingly the appraiser usually eliminates forced sales and purchases, negotiated purchases by condemnors, credit sales, transfers of convenience, trades, also jury decisions and awards.

A bona fide sale should have terms that are reasonably typical. The sales data may then be considered in respect to these points:

1. Record and title information
2. Size, shape, and physical characteristics
3. Locational features: relation to land patterns and the general neighborhood
4. Similar utility.

In respect to location, the best comparables may be at a considerable distance from the property being appraised, even in another city or state. Distance may affect the weight to be accorded to a comparable sale but not its pertinence; and, other factors being equivalent, more weight is accorded to the closer sales. The less data available, the farther the appraiser must search. He must decide why location of the comparable parcel is superior to, equal to, or poorer than the subject property location, and whether or not the comparable sale provides a valid indication of the probable price at which the subject property would sell. A sale which is not thus indicative serves no purpose.

To constitute a valid indication of the value of the parcel being appraised, a comparative sale should be reasonably similar in the characteristics given above, and reflect the current market. Prices

constantly fluctuate, not only in terms of the economy, but also in relation to the location and the type of property. Individual sales consummated in past years may be adjusted to a present market value indication on the basis of a time relationship, established through research of past and present market data.

Presentation of Data

In a typical situation, the appraiser might thus analyze and weigh a comparative land sale transaction:

Location:	1221 East Third Street, Blankville
Grantor:	A. B. Jones
Grantee:	Ray Brown Optical Co.
Date:	March 19, 19— (one year ago)
Size:	100 feet front, 80 feet rear, 130 feet deep, 11,700 square feet
Shape:	Narrows to rear
Public utilities:	Sanitary sewer, storm sewer, electricity, gas, water, telephone
Street and sidewalk:	36-foot wide blacktop, concrete curbs and sidewalks. Good condition
Soil and subsoil bearing capacity:	Good
Zoning:	B2—Business
Contour:	Level and at street grade
Location:	Corner
Other:	
Indicated price:	$15,000
Actual price:	$14,700 (verified by Mr. Jones)
Motives:	Purchaser constructing a single story commercial building. On market six months prior. Purchaser paid cash.
Unit price:	$14,700 ÷ 100 = $147 per front foot; $14,700 ÷ 11,700 = $1.26 per square foot.

Comparisons may be made in several ways. For example, if a square-foot basis is used locally, the comparison of the above sale

with the property being appraised may be made on a unit basis as follows:

Time Factor (in terms of market change):	
Market is improving	*add 5%*
Location: in same block as subject	*no adjustment*
Physical Factors:	
Shape: subject is rectangular	*add 5%*
Depth: subject is deeper	*add 10%*
Land pattern: subject is not a corner	*deduct 10%*
Other: same contour, public utilities, zoning, streets, sidewalks, etc.	*no adjustment*
All Factors:	*Add (net) 10%*

Estimates may be made in actual dollars rather than percentages. Comparison may also be indicated by narrative description. However, regardless of the method, the indication of value for the property being appraised would tend to be \$1.26 per square foot plus 10% (\$1.26 × 110%), which equals \$1.39 per square foot. Whichever method is used, it is good practice to work from the known to the unknown—i.e., from the comparative property toward the property under appraisal. A number of such comparisons may be presented in a chart. Adjustments may be explained in great detail, or a short statement may be used to summarize how the adjustments were derived and applied. Even if the explanation is short, it is advisable for the appraiser to keep in his files the complete reasoning process leading to his final conclusion. Whether shown in detail or retained in field notes, this conclusion should be supported by an analysis of the pertinent factors' effects on the value.

Land Value by Abstraction

Since the principles of balance and contribution affirm that a ratio tends to exist between the agents in production—land and improvements—an estimate of land value may be abstracted from sales of improved properties by allocating total sale prices between

land and building. The appraiser may first ascertain the portions of a property's value that may typically be considered attributable to the land and to the building.

That such a general relationship does exist in single-family homes is substantiated, for example, by reports of the Bureau of the Census of the United States Department of Commerce. For the United States as a whole, and also for four regions, figures are reported for the average value of improved lots as a percentage of the average sale prices of new homes. The percentage for the years 1969–71 was reported† as follows:

	Average		Average Value of Improved Lot as a Percent of Average Sale Price of Home by Location				
Year	*Sale Price*	*Value of Lot*	*U.S. Total*	*North-east*	*North Central*	*South*	*West*
1969	$27,900	$5,200	18.9	22.7	17.9	15.8	22.2
1970	$26,600	$4,800	18.3	21.4	17.6	15.7	21.6
1971	$28,300	$5,200	18.3	21.7	17.3	16.2	20.7

Observation confirms that, as the age of the improvement increases, the ratio of land value to the total value also tends to increase, where site characteristics are similar. If the property being appraised includes a lot of unusual size or of undesirable contour or shape, the typical ratio might be affected. Building costs may also influence the ratio.

Although a distribution or allocation of a price or value between land and improvements by statistical ratios can be useful at times, the procedure has limitations. For example, if typically 20% of the total sale price of a new home tends to represent the price at which comparable vacant lots have sold, then 20% to 25% of the sale price of an existing home might represent a fair allowance for land.

† Bureau of the Census, U.S. Dept. of Commerce, *Characteristics of New One-Family Homes*, Washington, D.C., August 1972, summarized in Commerce News Release #CB 72-160, U.S. Dept. of Commerce.

The allocation procedure also has applications in other classes of property. In a new apartment project, for example, a fair allocation to land might be, say, 20% of building cost or alternately a land value per apartment unit.

Another application of this procedure is to allocate, from the total sale price of a comparative property, that part which could reasonably be assigned as building value. The remainder, except for intangibles, must be the land. For example, assume that a 10,000-square-foot garage sold for $75,000. The appraiser estimates the depreciated cost of such a garage at $6 per square foot, or $60,000. The remainder of $15,000 may indicate a residual price of the land, assuming that the garage building represents typical or highest and best land use and that no intangible considerations were involved in the transaction.

In thus extracting land value from sales of improved property in an area where vacant land sales are lacking, this land residual distribution procedure may be applied first. The portion of the sale price allocated to land is then treated as if it were the price obtained in an actual sale of vacant land. The advantages are that a sense of proportion is retained. If the neighborhood is improved chiefly by certain types of properties which can afford only a certain land value, the typical vacant lot probably will not be improved by a much higher and better use. Where no vacant land sales are available, this method does afford an indication of land value.

Although perhaps applicable where there are no sales of vacant land or even where vacant land does not exist, the result of the procedure may not be conclusive, and may need collateral confirmation.

Land Value by Anticipated Use or Development

This procedure involves the comparison of undeveloped land to be appraised with another developed parcel for which individual lot sale prices are known. Data on sales of comparable raw land to developers, if available, is the best evidence of value.

When such market data is lacking, however, the anticipated use or development procedure may be applicable to raw unsubdivided land, potential residential subdivisions, new neighborhoods, reuse neighborhoods, or industrial centers or parks. In some circumstances, this procedure may be the only one available for valuing raw land.‡

For example, assume that a 20-acre parcel of undeveloped land is presently suitable for development as a single-family neighborhood, and is appropriately zoned. Sales of comparable parcels are lacking, but the value of residential lots in subdivision developments can be ascertained. The appraisal procedure follows:

1. Identify the economic bracket of the residents, and check the range of sale prices of typical new homes in that area.
2. By distribution, or comparison with lot sales in similar subdivisions, decide what figure represents a typical lot value in this category of development.
3. Study and lay out a subdivision plan to develop such typical lots.
4. Project the total probable gross sale price for these lots.
5. Estimate cost of streets and utilities.
6. Estimate sales cost and advertising.
7. Estimate overhead—taxes, carrying charges, inspection costs, etc.
8. Deduct these direct expenses for development from the figure derived in Step 4, to arrive at a potential raw land value estimate.
9. Subtract from this estimate an adequate profit allowance to cover the risk and provide incentive for the developer, so that the calculated value of the raw land is not, in part, development profit.
10. Subtract for "time lag"—the interest, at an appropriate risk rate, on the money invested for the time needed to complete the project.

The remainder represents the current value of the undeveloped land. It is the price at which it could reasonably be expected to be sold for development. Frequently the services of an engineer are required to establish a subdivision plan permissible under an existing building code. Evidence to support the projected cost

‡ The American Institute of Real Estate Appraisers, *Educational Memorandum No. 1, Subdivision Analyses* (Rev. 1973. Chicago: Author, 1973).

of streets and utilities may involve obtaining formal estimates from contractors.

Land Value by Land Residual Technique

In the absence of land sales to establish the value of a site by the market data approach, the value of land may be indicated by the land residual technique of the income approach. In this approach the net income of the site improved to its highest and best use is estimated. From this net income is deducted a fair interest return and provision for recapture of the estimated cost of the building and/or other improvements. The residual net income is ascribed to the land. Capitalizing this net income at an appropriate risk rate results in an indicated value for the land by use of the land residual technique. (See chapter on Direct and Straight Capitalization.)

Selecting the highest and best use is the first and most important step in the income capitalization approach to site valuation. The type of improvement which seems best suited to the land commonly is suggested by the present land-use pattern. But the problem is to ascertain the optimum quality or size of the improvement (principal of balance). To solve this, it may be necessary to process a series of gross and net income yields from hypothetical buildings of various types and sizes, to derive a use and program of future utilization producing the highest present land value. In other words, through the projection of a series of hypothetical buildings upon the site, one is selected which would produce the greatest residual return imputable to the land, and hence represents highest and best use. The procedure reflects an application of the principle of surplus productivity.

For example, the appraiser might test for a two-story building with a net income of $21,500 (net to land of $3,200); for a four-story building with a net income of $30,400 (net to land of $5,600); and for a six-story building with a net income of $50,000 (net to land of $4,000). It becomes apparent that the four-story building will yield the greatest residual return to the land. The

net income hypothetically assigned to the land in this income capitalization approach is the amount remaining after payment of all operating charges, plus interest on, and recapture of, the building investment. The land earnings are the final consideration and therefore are residual.

In appraising a site, the land residual technique should be used with special care, since alternate assumptions of highest and best use may produce a considerable difference in the residual net income imputable to the land. Any such difference is magnified by the process of capitalization. Further, the divergencies in the final result may be substantial even if the estimated rate or rates of capitalization vary only nominally.

The land residual technique brings more satisfactory results when the number of estimates made by the appraiser are held to a minimum. For example, the highest-and-best-use estimates necessary in arriving at the cost of replacement and the net rental of a one-story building may be materially less than the estimates required to arrive at such figures for a multistory office building.

Applied generally to income-producing property, the land residual technique is useful either as a check against the market data approach, or as an alternate means of estimating land value when the market data approach is inconclusive. Further details on the application of this technique are explained in the chapters on capitalization.

Variations in the Problem

The same fundamental principles underlie all site valuation. However, the key factors which influence the utility and value of a given site vary with the type of property being appraised. For example, a factor, such as heavy pedestrian traffic, which tends to create value in a business site, might detract from the value of a residential site. Aesthetic considerations, which are of paramount importance in a residential site, might have different significance in a business site.

Major value factors influencing the value of a site vary with

different types of land use. Examples of such factors are: convenience of location and other amenities, for residential sites; location in the trading area, the community's purchasing power, and the relative availability for business sites; zoning regulations, the convenience of location to shipping facilities and labor sources, and the degree of proximity to related industries for industrial sites.

Factors which control the value of single-use or service properties are legal, physical, and locational adaptability to the intended use. The value of a park site, for instance, depends on its relation to the existing city plan; of a golf club, upon its convenience to the people to be served; of cemeteries, upon matters of license (governmental permission) and the endorsement of religious groups.

Summary

Of the four procedures for site valuation, the market data or comparative process is basic. After obtaining pertinent sales data, the appraiser decides if the sale was voluntary and bona fide. If so, he compares it with the property under appraisal in terms of time, location, and physical characteristics. Adjustments are made to derive an indicated value for the site being appraised.

Other procedures are useful in the absence of comparable sales or when circumstances indicate their application. The abstraction procedure is helpful in older neighborhoods and as an aid to the market data approach. The development (subdivision) procedure is helpful when applied to tracts of land ripe for improvement. The land residual technique is applicable principally to income-producing sites, either as a check against the market data method, or as the major consideration when adequate market data is lacking.

The major factors influencing site values vary with the highest and best use of the land.

CHAPTER NINE

Residential Styles and Functional Utility

THE PRIMARY CONCERN in the appraisal analysis of any residential property is its degree of marketability, or acceptability when offered for sale. The residential appraiser is aware of current standards in design, materials, styles, and functional utility, in order that he may judge the relative value of amenities in his study of each residential property. He also analyzes the market in which this property is to be sold, since marketability is the final test.

Architecture

A maximum contribution to the degree of marketability is made by factors generally included in the term *good architecture.*

Rarely the result of fortuity, good architecture is characterized by the natural, unpretentious use of appropriate materials, in the proper scale, and in harmony with the setting. An expert combination of mass, materials, openings, and detail is inherent in good architecture, which, however, is not limited to elements of exterior style or design. It also includes consideration of interior functional utility, which can be achieved only through sound planning. These characteristics, suitably combined, create and sustain the market value of a residential property.

Almost any new home, if not totally inappropriate, will sell because of the appeal of its newness. But when this wears off, a house lacking a fundamentally appropriate design loses marketability.

Good architecture does not mean that every residence need be individually designed by an architect. A subdivision developer may have an architect design five or six styles of homes suitable for the range of lots in a new development, and then build dozens of homes of each style, modified to suit individual purchasers or specific lot topography. Many successful builders or developers have acquired the ability to construct very acceptable residences from stock plans designed by architects.

Changing Demands in Style

Attitudes demonstrated in the market dictate both style and design. The value of a residence decreases if prospective buyers do not like the design, no matter how authentic it may be.

Public taste in residential styles goes through long cycles, with extensive changes, not all of which reflect sound judgment and economic considerations. It is illuminating to review the succession of architectural preferences which flourished and waned. The Victorian style, with its many small rooms and gingerbread trim, was considered at the time a great improvement over earlier designs. The shift from Victorian to classic styles about 1900, and the public acceptance of English and French exteriors may be considered reflections of improving public taste. In the northern United States (1919–1935), English architecture was widely accepted. Preference then shifted to colonial styles (1925–1950). During that period, Cape Cod homes of one-and-a-half stories became popular. The simpler colonial and Georgian styles gained a regional popularity before and after the World-War-II period. This change in public taste resulted partly from the premium on construction economies, as building costs mounted. Again in the 1970's, the demand for colonial designs continues strong in many areas of the nation, particularly in the higher price ranges.

The so-called international modern (or contemporary) style, with its flat roofs, failed to gain general acceptance either when introduced in the 1930's or during the next 40 years. Similarly

disregarded were the butterfly roofs and window walls of a later "contemporary" design.

In the South and West, adaptations of Spanish and Mediterranean styles were favored as especially suited to the local climate. These, together with the California style of patio house, were built in many regions including the Midwest, reflecting an indoor-outdoor living concept. They were widely used in the increasingly popular planned environmental developments, with cluster housing, zero-lot line areas, and public green space. Variations and adaptations of Cape Cod and farmhouse styles have continued to command approval in the physical environments and climates for which they were originally designed.

The trend to the modified ranch-style dwellings and houses with a story and a half resulted from the larger suburban lots made available in the 1950's and 1960's, and from a widespread desire to avoid stairs. This trend was so compelling that almost any spread-out arrangement with all or most of the living space on a single floor was labeled ranch house or modern—or mislabeled contemporary. Limited popular approval was gained by a subsequent trend to tri-level or split-level and modified two-story homes, which involved limited stair runs and were built in response to the need for larger quarters and for economy in the face of high building costs.

Apartment buildings have been subject to less striking changes in design and style. Their ornamental details, however, tend to follow the popular residential trends. Large porches have been eliminated since about 1915. During the 1920's English and Gothic windows were popular. Georgian style, with white trim, ornamental stone and slate, was used extensively from 1930 to 1950. Then the trend changed to simple lines and the large glass surfaces which are characteristic of modern structures, such as office buildings, motels, and apartments.

During the 1960's and into the 1970's the most popular design in walk-up apartment houses has been a two-story, open-balcony,

garden apartment (often three-story where the lot grade allows entrance at the second level on one side) which had its origin in California. The mansard roof design has been extensively used in garden-apartment projects. There has also been a trend toward planned unit developments of single-family and multiple family units. These may consist of several buildings of apartment units arranged on a large parcel of land, with open green areas and recreational facilities. Often such developments include a mixture of single-family homes on lots or in clusters, or they may consist of townhouse and garden-apartment units, either rental or condominium.

Use of Materials and Design

The basic design for a residence is deficient if it combines incompatible architectural styles or too great a variety of materials. Other liabilities include a number of distracting features, poor or incorrect proportions, or a lack of balance. After selecting at random—with no coordination—an attractive entrance from one style of house, a beautiful roof and eave design from another, a charming bay window from a third, and a graceful chimney from still a fourth style, a buyer or owner may wonder why the attempt to build a dream house produces an unbalanced monstrosity.

The house designed to be built of one material seldom can be built of another without altering the desired effect. If a builder substitutes brick in constructing a house designed for exterior horizontal wood siding, the long horizontal lines and shadows of the wood siding are lost; so may be the sense of breadth that the architectural design was intended to convey. A similar loss occurs if asbestos shingles or board-and-batten siding are substituted, perhaps in an attempt to reduce cost. Such substitution often destroys the architectural aesthetic balance between height and breadth. Similarly, the desired architectural effect may be destroyed if aluminum sliding windows of improper size and proportion are installed to replace colonial wooden double-hung sash, or a functional double-thickness aluminum chimney pipe is used to replace a

graceful brick or stone chimney. The use of a mansard roof for a two-story house has become popular. Asphalt shingles, substituted for wood shake shingles, lose the depth-line and shadow effect, thereby cheapening the appearance of the whole.

When a builder or owner includes too many features in one house, the result may appear awkward, out of proportion. For example, a roof gable above a screened porch on the front of a house with a bay window, picture window, and a basement garage entrance may reduce the acceptability of the house to neighbors or prospective buyers.

A builder who attempts to imitate materials also demonstrates poor taste and judgment, whether the imitation is within or without the structure. For example, the use of scored sheet hardwood panels with an enameled surface, or a plastic tile in lieu of ceramic tile for wainscots in bathrooms or kitchens, implies a cheaply built house.

A poor appearance may result from the use of too wide a range of materials for exterior finish. Few buyers would be attracted to a bungalow or small ranch house if constructed with wood or hardboard siding on rear and side walls, a half-brick front wall on a concrete foundation with stucco or plywood paneling above it in a contrasting color, aluminum shutters on front windows, and wrought iron posts on the front porch slab to support rough-hewn wooden beams for the porch cover.

Relation to Site

Architectural style and execution should be related to the site, or all effort to achieve good design may be lost. The house planned for a 40- or 50-foot lot may not utilize the advantages or justify the cost of a lot 60 or 70 feet wide. A rambling ranch house designed for a suburban lot might look completely out of place on a small urban site. The house which presents a charming appearance on a wooded slope might be totally unsuited to a level lot devoid of trees. A house skilfully designed to blend into its location between a Georgian house and an English style might be

entirely inappropriate elsewhere. Relating the design to the site is fundamental to good architectural practice.

The crowded appearance which characterizes so many older neighborhoods in urban areas is the direct result of building houses on lots too small to accommodate them properly. It may be apparent to an appraiser that the lots were divided or compressed because of the high cost of installing utilities, or because of limited available raw land within practical reach of public transportation, whereas the houses were built to accommodate the limits of their buyers' purses, and to conform to zoning laws and other restrictions. The dimensions may also reflect the contractor's desire to realize a profit on as large a house as potential buyers in the area could afford.

These factors still exist. Lots are larger in many areas, but the dimensions of the houses have also increased, with the result that many subdivisions of large functional homes look overcrowded. In general, however, the land-to-building ratio has improved in response to demands imposed by home buyers and lenders of mortgage money.

In some areas zoning is criticized for requiring such large lots that the building density is too low. Some lot size requirements are said to prevent the construction of low- and medium-priced houses. Rising costs and scarcity of land have contributed to high density housing, such as cluster housing, rowhouses, and patio houses. These all use less land per family than typical single-family suburban lots.

Functional Utility and Inutility

Marketability is the ultimate test of functional utility. If a property is sufficiently useful and desirable to attract buyers, and if it can be sold and resold without a substantial discount in price, it possesses the necessary degree of functional utility to sustain marketability and value.

A high degree of functional utility is the result of good plan-

ning. Consider, for example, two houses, side by side, on similar size lots, with the same number of rooms and the same total floor area. The two houses are new, erected by the same builder with the same crew of workmen, and the cost to build is the same. Here the similarities end because the two houses were built from different plans. The first house reflects excellent layout and design. The room sizes and shapes are good and the arrangement is convenient, providing ample light and air. There is a good pattern of traffic flow, the areas of different use are separated, and the closet space is ample. The sum of the house's advantages makes it comfortable and attractive, and readily marketable at a price commensurate with its cost.

The second house is poorly designed. The rooms are badly proportioned, dark, and so awkwardly arranged that the areas of different use interfere with each other. In addition, the hall is too long, too narrow, and storage space is inadequate. The house is hard to heat and to ventilate. Prospective buyers regard it as undesirable, which results in a loss of value. This loss is in reference to the norm, represented by the functionally acceptable home. The finest materials, structural soundness, and superior condition may not offset a loss in value due to functional inutility.

Since acceptability of a property when offered for sale is the final test, it is essential that the appraiser understand the market and know how to measure the effect of deficiencies noted during his inspection of the property. Its functional utility is considered good, in spite of possessing a number of theoretical deficiencies, if these do not adversely affect its marketability.

The appraiser weighs the amenities afforded by a specific residential property, in the light of current market demands and his understanding of the requirements of functional utility. In forming his estimate of its public acceptance, he considers the characteristics and customs of the nearby residents in order to estimate the extent to which a design meets the needs or desires of this population. Thus the appraiser assesses the possible requirements

of a prospective purchaser who is typical for the particular price range. These may vary widely. The appraiser keeps in mind that considerations which seriously influence the market value of a high-priced house may have little or no bearing on the value of a house in a lower price range. The converse also is true. An example of a theoretical deficiency is the location of a bedroom off the dining room of a 60-year-old house in a lower-middle-class neighborhood. The lack of an entry hall, and the traffic pattern through living and dining rooms in this house result from poor planning and violate functional utility. Though the typical purchaser of the 60-year-old house would probably not object to these deficiencies, they would lower the value of a new house, as unacceptable to prospective buyers.

Judgment is needed to evaluate the floor plan of a particular house. Whether a residence possesses functional utility probably can be decided only after its good points and faults are weighed in the light of numerous considerations, such as price range, style, design, age, and location. Since these factors affect minimum requirements, they are omitted from the following checklist, which is applicable to both the small two-bedroom city bungalow and the larger suburban house.

I. Floor plan and layout
   A. Room sizes and shapes
      1. Adequate size and usable shape
         a. Living room
         b. Kitchen
         c. Dining room or dining area
         d. Master bedroom
         e. Other bedrooms
         f. Family room or recreation area
      2. Wall space in relation to furniture requirements
   B. Circulation
      1. Entry hall: direct access to kitchen, living room, dining room, bedrooms
      2. Rear entry to kitchen
      3. Direct access, garage to house

4. Mud entry: for small children
5. Room relationship
   a. Bedrooms to bath
   b. Living areas to bath
   c. Kitchen to dining room and living room
   d. Bedrooms separated

C. Privacy
1. Access to bedrooms
2. Access to bathrooms

D. Doors
1. Location—convenient
2. Swing—not objectionable
3. Adequate size
   a. Front and rear entrance—to pass appliances
   b. Rooms—to pass furniture
   c. Closets and bathrooms

E. Light and air
1. Single exposures
2. Cross ventilation
3. Windows—type and material
4. Screens and storm windows
5. Glass area in relation to room size
6. Exterior obstructions
   a. Porches
   b. Roof overhangs
   c. Adjoining buildings
7. Patio door—view

F. Halls
1. Area in proportion to house size
2. Location and appearance
3. Lighting

G. Stairs
1. Upper floors
   a. Location and appearance
   b. Width and steepness
   c. Tread and riser, size and proportion
2. Basement
   a. Width, steepness of stairway, handrail, and headroom

H. Storage—adequacy and location
1. Bedroom closets
2. Hall closets
3. Guest closet

4. Linen closet
5. Basement storage area
6. Other storage area in house
7. Garage storage area

I. Laundry facilities
1. Location and space
2. Plumbing and electrical connections
3. Vent for dryer
4. Space for clotheslines in basement

II. Equipment
A. Heating
1. Type of unit and fuel
2. Local acceptance
3. Adequacy
4. Automatic controls
5. Insulation
6. Other—humidifier, air cleaner
7. Air conditioning—type and adequacy

B. Electric
1. Adequacy of service, distribution panels, and circuit wiring
2. Adequate number of convenience outlets, fixtures, switches
3. Adequate wiring for appliances

C. Plumbing
1. Adequate supply and drainage piping
2. Number of bathrooms and powder rooms
a. Quality of fixtures
b. Finish of wainscot and floors
c. Vanities, mirrors, linen closets
d. Ventilation
e. Bathroom heater
f. Hot water heater
g. Basement floor drains
3. Exterior hose connections

D. Kitchens
1. Finish of floors, walls, splash areas
2. Wall cabinets
3. Base cabinets, sink and counter-top
4. Built-in appliances
a. Garbage disposal
b. Dishwasher
c. Ventilating fan and hood

d. Range and oven—type of fuel
e. Other
5. Pantry
6. Lighting

E. Other appliances—built-in or connections
1. Washer
2. Dryer
3. Refrigerator
4. Deep freeze
5. Power tools
6. Vacuum cleaner system
7. Other

F. Hardware
1. Suitability for property
2. Quality, condition, and finish

G. Fireplaces

H. Special equipment
1. Bell and call system
2. AM-FM radio and intercom
3. Mail boxes
4. Burglar alarm or ADT system
5. Sump pumps
6. Fire protection system
7. Elevator: type, capacity, specifications
8. Incinerator
9. Other

III. Garage
A. Style compatible with house
B. Size and capacity
C. Location
1. Detached
2. Attached
3. Doors exposed to street
4. Doors not exposed, but garage wall a part of house front

D. Doors: type, size, automatic
E. Utilities: lighting, water, heat

IV. Site
A. General
1. Balance: relation of lot to house
a. Adequate size lot
b. House suited to lot
c. Property compatible with neighborhood

2. Light, air and view
3. Nuisances: noise, odors, appearance
4. Privacy: proximity of other buildings
   a. Side yard, especially for bedrooms
   b. Rear yard, space for patio, garden, recreation
5. Setbacks, proximity to traffic
   a. Pedestrian
   b. Vehicular
6. Landscaping
   a. Lawn
   b. Trees
   c. Foundation planting
7. Service facilities
8. Drainage
   a. Grading
   b. Downspouts

B. Yard improvements
1. Walks, material
2. Fences, garden wall, retaining wall
3. Patio or terrace
4. Garage driveway
   a. Material
   b. Width, turning radius, grade
   c. Location with respect to house entries
   d. Ingress and egress, alley
   e. Traffic hazard at street
5. Underground improvements
   a. Sewers
   b. Electric service
   c. Telephone service

C. Topography
1. Placement of house
2. Steps to entrance: number, railing
3. Driveway, grade
4. Grading and drainage
5. Usable yard area

Experience teaches that public taste and market acceptability are subject to constant change. Extremes in architectural style or floor plan often prove to be poor investments, since designs or layouts in favor at present may be in disfavor next year. A good

design and layout based on public acceptance, a degree of conservatism plus reasonable individuality, with a proper regard for the character of the surrounding development and neighborhood, all combine to produce a residence with an inherently stable market value.

Sound Planning for Houses

The appraiser acquires a familiarity with local conditions and with the basic types of residential design, construction, and floor layout. The one-story single-family house may be large or small, of costly or inexpensive construction, and with infinite variations in floor plan and layout.

Government agencies have underwritten the financing and construction of many small homes, one of the benefits of which has been the widespread acceptance of low down-payments and amortized long-term monthly mortgage payments. This easier financing has contributed to a large increase in small homeownership. In the 1930's and 1940's many homes were erected in accordance with minimum government standards. The typical small, competitive or subdivision house included a living room, kitchen, two bedrooms and a bath. If there were no basement, a utility room was provided. There was usually an attached or basement garage, or an attached carport. The dining space often was included in a larger living room or kitchen, but often the space was arranged to include a modest dining room. These homes were in demand and served their purpose well. There was generally a good use of space, fairly large living rooms; efficient kitchens equipped with cabinet sink, base and wall cabinets; and adequate dining and closet space. Time, however, showed that lack of a basement tends to affect adversely resale value in cold climates and that one medium-sized and one small bedroom were inadequate for growing families.

When the one-story, medium-sized ranch house on a larger lot first became popular, the layout usually included a third bedroom

and an additional half- or full second bath. In the higher price ranges formal dining rooms were included; but for the medium-sized ranch house, the space ordinarily used for dining was sometimes made part of a family room or recreation room. Additions were readily made to this design, which resulted in L- or U-shaped layouts, maximizing available light and ventilation. Patios, porches, breezeways, and garages were often included in the floor plan.

The reproduction cost of comparable areas of living space is highest for a one-story house, because basement, foundation, and roof do not serve two or more levels, as they do in a multi-story house. As indicated by market acceptance, people who can afford the extra cost prefer the single-story plan, as it eliminates stairs and simplifies maintenance and housekeeping. Since the long, low fronts appear impressive, the garage wall is sometimes added to the façade dimension, with an entrance at the side or rear. The availability of larger lots, and the less dense zoning in suburban areas has made this trend possible.

The story-and-a-half house represents a better utilization of living space. Often two-story houses are designed to look like one-and-a-half story houses, to achieve long, low, sweeping roof lines. The Cape Cod home usually provides one or two bedrooms on the first floor, but uses attic space with dormers for additional bedrooms and bath.

In northern regions of the United States, a popular style of dwelling has two stories and six rooms, three of which are bedrooms. Usually the house provides a full basement, with living room, dining room, and kitchen on the first floor. All but the lowest in cost include a first-floor lavatory, a breakfast room in the kitchen, and a small entry hall with good traffic pattern. The three bedrooms on the second floor are medium to large in size, with cross ventilation, and good closet space. This compact two-story house provides the greatest amount of living space per housing dollar invested. Some decline in favor resulted from the dislike of stairs at a time when larger lots became obtainable in new

suburban communities. There has, however, been a reverse trend to two-story homes and even to townhouses and row houses. Some of these have a third level for a basement and recreation area.

The larger two-story house provides four or more bedrooms, two or more baths, and usually a family room on the first floor. The preference is now for a private bathroom for the master bedroom, and another bathroom centrally located to serve the other bedrooms. At least a half-bath is conveniently located on the first floor. Dressing rooms have become less popular; if present, they are smaller and may be part of a two- or three-section bathroom, consisting of toilet and tub, vanity lavatory and mirror wall, and large walk-in closet. Servants' quarters are less important because domestic help seldom "lives in." Rooms formerly used for that purpose are now considered as extra bedrooms or guest rooms. Garages are generally attached and are usually double or even triple in size.

The split-level home, built in increasing numbers since the 1950's, has the advantages of short stair flights, excellent utilization of space, and substantial economy in construction cost. The design is well adapted to sloping sites, and is suitable for lots where construction of a single-story ranch house is impractical. The exterior appearance of the split-level home is considerably different from that of one-and-a-half stories. When attractive and appropriate to the site, many variations in split-level design have been well received.

Sound Planning for Apartments

In the analysis of an apartment building, an accurate room count is important, since it provides a basis of comparison for the various designs and layouts found in the locality. The apartment is often rated and rented on the basis of its room count, as well as on the total square-foot area.

The minimum room sizes for apartment units, as recognized by the Federal Housing Administration, are shown below.

MINIMUM ROOM SIZES FOR SEPARATE ROOMS (TABLE 4–1)★

	Minimum Area (Sq. Ft.)					*Least*
Name of Space[1]	*LU with 0-BR*	*LU with 1-BR*	*LU with 2-BR*	*LU with 3-BR*	*LU with 4-BR*	*Dimension*
LR	NA	160	160	170	180	12′ 0″
DR	NA	100	100	110	120	8′ 4″
K	NA	60	60	70	80	5′ 4″
Kette[2]	30	40	NA	NA	NA	3′ 6″
BR (primary)[3]	NA	120	120	120	120	9′ 4″
BR (secondary)	NA	NA	80	80	80	8′ 0″
Total area, BR's	NA	120	200	280	380	—
OHR[4]	NA	80	80	80	80	8′ 0″

★ FHA No. 2600, February 1971, *Minimum Property Standards for Multifamily Housing,* pp. 70–73.

Notes:

1. Abbreviations:
   LU = Living unit; K = Kitchen; OHR = Other habitable room
   LR = Living room; Kette = Kitchenette; 0-BR = LU with no separate bedroom
   DR = Dining room; NA = Not applicable
   DA = Dining area; BR = Bedroom; SL = Sleeping area
2. Every Kitchen or Kitchenette shall contain fixtures providing the basic facilities. . . .
3. Primary bedrooms shall have at least one uninterrupted wall space of at least 10 feet.
4. Other habitable room (OHR) includes rooms such as dens, music rooms, libraries, family rooms, etc. . . .

MINIMUM ROOM SIZES FOR COMBINED SPACES (TABLE 4–2)★★

	Minimum Area (Sq. Ft.)				
Combined Space[1, 2]	*LU with 0-BR*	*LU with 1-BR*	*LU with 2-BR*	*LU with 3-BR*	*LU with 4-BR*
LR-DA	NA	210	210	230	250
LR-DR	NA	240	240	260	280
LR-DA-SL	250	NA	NA	NA	NA
LR-DA-K[3]	NA	270	270	300	330
LR-SL	210	NA	NA	NA	NA
K-DA[4]	100	120	120	140	160
K-DR[4]	NA	150	150	170	190
Kette-DA[4]	80	90	NA	NA	NA

★★ FHA No. 2600, *ibid.*

Notes:

1. See Note 1 Table 4–1 for abbreviations of Rooms and Combined Spaces. Refer to Table 4–1 for minimum dimensions required. The minimum dimensions of a combined room shall be those of the individual single rooms involved, except for the overlap or combined use of space.

2. For two adjacent spaces to be considered a combined room and be eligible for the reduced areas permitted, the clear opening between the spaces shall be adequate to permit common utilization of the spaces for the different functions. In general, the horizontal opening between spaces shall be at least 8 ft. 0 in., except that between kitchen and dining functions, the clear horizontal opening may be reduced to 6 ft. 0 in. Spaces not providing this degree of openness shall meet minimum room sizes required for separate rooms.

3. A combined LR-DA-K shall comply with the following: (a) the food preparation-cooking area shall be screened from the living room sitting area; (b) the Kitchen shall be at least 60 sq. ft.; (c) the clear opening between the Kitchen and the Dining Area shall be at least 4 ft. 0 in.; and (d) the Kitchen shall be convenient to the Dining Area for serving.

4. These required minima apply when only eating space is in kitchen. When adequate eating space is provided elsewhere in living unit, kitchen or kitchenette minimum areas apply.

Large, modern apartment houses are usually designed to obtain a degree of privacy while affording maximum light and air. Space and location requirements imposed by elevators and orientation may dictate the decision for a central main lobby entrance or for several stairway-lobby entrances. The need for security measures may make it desirable to design one main entrance with interior access to other stairways. Modern garden apartments located on a slope may have at least one entry to the second floor, limiting stairs to one flight up or down. When compatible with climate, garden apartments may have individual entrances off exterior corridors resembling balconies.

Except for higher priced units, the modern apartment offers less flexibility in layout because standardization is now a prime aim in apartment house planning, design, and layout. The objective is to provide one or more windows for each room, while wasting as little space as possible. The areas of the dining space, kitchen, and baths are frequently kept to a minimum, with the other rooms planned to be as spacious as possible. The efficient use of space for utility rooms or storage facilities can eliminate basement area and the former lockers. A utility closet may contain an individual heating unit, hot water heater, or a central heating and air-conditioning unit.

Laundry facilities are often included with coin-operated equipment in central areas of lower or medium priced apartments. Connections for washer-dryer units in utility rooms are included in medium and higher priced apartments. Garages usually are found only in medium or higher priced units, and the entire basement or first story may be used for this purpose. Garden apartments usually have surface parking areas on the site and may provide necessary parking for tenants and guests.

Most new apartment buildings do not have living quarters for janitorial help, and in the older units these facilities are seldom used for their original purpose. Gas for heating requires almost no supervision, and the cleaning and maintenance formerly required of resident janitors may be handled by individuals under contract to a number of buildings.

Beginning in the 1960's, nearly all new apartments had (or provided for) air conditioning, usually a combination heating and air-conditioning unit for each apartment; and the kitchens were equipped with appliances, dishwashers, and garbage disposers. This trend is growing even in some northern states where air-conditioning needs are less critical.

Since many apartments built before World War II will not meet existing building-code requirements, substantial expenditures may be required to make them conform. Like single-family dwellings, many of the older apartment buildings, with faults not acceptable in newer structures, may be considered entirely adequate by the tenant who can afford to pay only the lower rents in their neighborhoods. Older apartment buildings should be compared to similar ones and penalized only for faults uncommon to their vintage.

Equipment

Items of equipment, including utility systems, fixtures, appliances, cabinets, and other built-in features, seem to represent increasingly higher proportions of the total cost of a residential unit each year. The quality, character, and extent of these items can affect marketability as much as the functional aspects of architectural design and layout.

The appraiser should study the heating system, the water piping, the air-conditioning, the electrical system, the bathrooms, the kitchen, and all of the other systems or areas which include the various items of equipment and fixtures. Other factors being equal, the more modern and complete the equipment, the greater the market acceptability. Many brokers who deal in residential properties agree that the woman's influence is important in the selection of a home, and that she may be inclined to overlook other faults if the dwelling unit provides ample closet space and attractive modern kitchens and bathrooms. Many men are increasingly concerned about the quality, condition, and adequacy of heating and air-conditioning systems, or of built-in kitchen equipment. The growing tendency is for appliances, formerly

considered personal property, to be built in. Wall ovens, countertop ranges, dishwashers, and disposal units contribute to sales appeal. Modern wall and base cabinets, plastic covered work surfaces, ceramic tile splash areas and vinyl asbestos tile all heighten the attractiveness and efficiency of a kitchen, emphasizing the gulf between the modern and the old.

Bathroom equipment, fixtures, and finish are other major considerations for a purchaser who easily recognizes new styling and utility. Value and acceptability are increased by ceramic tile, medicine cabinets, shower stalls, vanity lavatories and counters, modern lighting, and an adequate linen closet. Many owners of older residential properties have found that here cost does not always equal value. In the bathroom, as in the kitchen, often it is not economical to replace a good, serviceable item for the sake of modern style or utility. The owner may pay for a complete kitchen remodeling project, only to discover that the cost cannot be fully reflected in the subsequent sale price. Though the modernized kitchen does make the property more salable, some of the cost must be "lived out" as an amenity of ownership, being more fully appreciated by the person making the expenditure than by a prospective buyer.

This is a difficult phase of the analysis for an appraiser, and also for an owner who is considering the sale of a residence. When items of equipment are worn out, do not operate properly, or are broken, there is little question that they are replacement items and should be treated as such. But, where a fixture, cabinet, or appliance is merely old, old-fashioned, or out of style, it may be better to maintain it. A new owner may decide to replace it, and to enjoy the increased amenity value resulting from his expenditure.

Modernization and the replacement of equipment, utility systems, and fixtures must be carefully considered. In most cases, the cost of replacement is not fully reflected in value, but some percentage of the cost should be regained. Consideration of the other elements and aspects of functional utility may also influence

the role of the equipment in the measure of marketability and acceptability.

As in valuing single-family houses, the market acceptability of apartments is reflected in the effect that the presence or absence of an item of equipment has on rent obtainable from typical tenants. To be considered also are laundry facilities, carpeting, draperies, shades or blinds, stoves, refrigerators, and elevators.

The principle of balance,* as it may apply to interior or exterior aspects of a residence, deserves careful study by the appraiser. Prevailing circumstances, customs, and requirements help to explain and refine the relationships which represent proper balance in a specific situation. A lack of balance, in which the size or cost of the improvement or any of its individual parts is too great or too small, and hence out of proportion for the neighborhood, the site, or the remainder of the structure, implies a probable lack of market acceptability with a resulting loss of value for the improvement.

Some houses and apartment buildings are designed in a manner to make later additions or modifications practical. Since this often helps to keep a property closely in step with current construction developments, it should add to value. Examples are the house built with a sunroom or breezeway which can be incorporated into a living room, the unfinished area in a grade entrance basement which can be converted into a family room or playroom, and the unfinished area in a story-and-a-half house with dormers that can be finished as bedrooms and a bath. In all of these examples, the principle of balance should be kept in mind. The cost of such an addition or modification (extra initial cost and later finishing cost) may be reasonable and economic to the individual planning it. However, the cost, layout, type of finish, or design may not suit a prospective buyer, and may be heavily discounted to arrive at his opinion of market value.

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* See section on Surplus Productivity or Balance in the chapter on the Basic Principles of Real Property Value.

A home built to the specifications of an individual for the occupancy of his family usually exhibits the particular tastes and requirements of that owner and his family. For a given total area, a childless couple might desire a large dining room and living room, but only two bedrooms. A large family, on the other hand, would prefer a large kitchen, more bedrooms, an extra bathroom, a large family room, a small living room and no dining room. Either of these two homes might encounter a limited market with a loss in acceptability and consequently a lower value—except to a similar user. Since value is affected by such considerations, potential loss is taken into account by the appraiser.

The ideal plan for a single-family house or apartment probably has never been achieved. Family needs or desires change, and what is considered essential today may become nonessential tomorrow. However, experience has shown that the living unit planned and constructed to meet the most typical demand—the average requirements of the largest number of families—achieves maximum market value.

Summary

The primary concern of the appraiser in the analysis of a residential property is to weigh all the factors governing its acceptability to prospective purchasers or renters. The architectural design should be appropriate to the site, with good proportions and no distracting features. The plan should be functional, efficiently meeting the requirements of typical purchasers or renters in the price range and location. Equipment and other features of the design should be similarly functional and acceptable in the local market. The property should comply with the principle of balance. The appraiser extends his analysis to include the community, in order to consider the architectural style in the light of local trends, climatic conditions, and social factors, since these considerations are also influential in the final test—the acceptability of the property to buyers and prospective tenants.

CHAPTER TEN

Commercial and Industrial Functional Utility and Inutility

Functional utility, as related to commercial or industrial properties, pertains to their efficiency and desirability for their intended use. In the preceding chapter, functional utility was broadly defined as the sum of a property's attractiveness and usefulness, the ultimate test of which is reflected in its marketability. If a property is sufficiently useful and desirable to attract buyers at a reasonable price, then it possesses functional utility. The word functional, in appraisal practice, refers to the physical characteristics of a building with reference to the design and ability to perform some useful purpose. Thus, the term functional inutility (or disutility) implies a loss in desirability or usefulness arising from some inherent physical characteristic which is measurable by a loss in market value.

Architectural style is not so important for commercial and industrial buildings as for residential property. Although there are striking differences in architecture from one period to the next, commercial and industrial buildings of a particular age tend to maintain relatively consistent designs. Changes generally result from the development of new materials and methods of construction or from new and added functional requirements. The floor plan and layout are of major importance in the commercial building or industrial facility because they are closely related to usefulness and efficiency. The relationship of the site area to that of the building is also significant.

The appraiser's knowledge, understanding, and skill are here

developed, as in other areas, through experience and by keeping informed of current trends and developments. Almost every merchant, operator, or manufacturer is a source of current information because of his position to know and advise of changes in space and design requirements pertinent to his type of business or operation. Accordingly, a building's owners or tenants may be excellent sources of information. Is the building well adapted to the occupants' operation? What are its deficiencies? What can be done to make it more useful or suitable? How does it compare with a new, modern, functional building?

Current periodicals, technical bulletins, case studies, experience exchange reports, and other published material, available for many types of commercial and industrial properties, are a means of keeping informed concerning the trends of equipment and design.

Retail Store Buildings and Shopping Areas

The appearance and character of retail store buildings has changed substantially over the years, reflecting changes in merchandising patterns and building materials. The typical downtown or central business district and strip-type outlying retail subcenters have been supplemented by the modern shopping center and free-standing suburban shopping facilities. All four of these retail types are in use.

Shopping centers may often present the physical standards with which older store buildings are compared. The large shopping center is designed to enable a group of merchants to offer their supporting community a complete range of products and services. Problems which face the developer of the shopping center include how best to group the stores in relation to each other, how to plan circulation to make the maximum number of stores accessible, with display windows visible to the shopper, and how to provide maximum parking at a minimum distance. The latest designs include completely enclosed malls, which are heated and air conditioned to provide all-weather shopping. Additional amen-

ities frequently include patios or landscaped public areas. It is common practice for larger centers to include other free-standing buildings such as banks, supermarkets, auto service, office buildings, medical buildings, bowling alleys, theatres, and restaurants. Desirable center locations are near intersections of major highways, which afford rapid access to the population providing economic support.

Still in use are many of the retail store buildings that were typical of central retail locations or strip-type, outlying shopping areas. They have changed little in appearance or character over the years.

Columns or bearing walls were spaced at 14- to 20-foot centers, related to the load capacity of ceiling joists. Usually there was a basement to accommodate a heating plant, toilet, sink, and merchandise storage. When the structure included a balcony in the rear, it was used for office and storage. The store front was glass above a bulkhead under the show window, and the front door was recessed. The rear door opened to an alley or rear yard. The driveway, if any, was narrow. Access from the alley made possible deliveries from the rear.

The rapid growth of chain stores and improved building methods have brought about many changes. In the modern store building, which is larger, the use of newly designed techniques with steel beams and bar joists allows bays of 30 to 60 feet, providing large uncluttered space and flexibility in placement of dividing curtain walls. Some basement area may be included, depending on the needs of the tenant. The store front may be a floor-to-ceiling glass-and-metal treatment, sometimes tilted or on a slight diagonal leading to the door, and there may be a protective canopy. The rear door usually opens on a delivery dock with sufficient access area to permit truck traffic. Lighting is generally high intensity, and includes spot and decorative lighting. Convenient electrical outlets and power capacity are provided for showcases, displays, and appliances. Heating is by unit heaters with free-standing air-conditioning units or all-weather central systems with

duct distribution. Long, unbroken wall surfaces permit maximum display. Storage areas are well lighted and conveniently arranged. Floor surfaces may be terrazzo, vinyl tile, or carpet. Ceilings are generally of acoustic material.

Obsolescence in an old building may be partly curable because many such modern features can be installed. Incurable obsolescence is comprised of those things that cannot be remedied, either because of physical limitations or because the change would be so expensive as to be uneconomic. Such items may include close column spacing, fixed partitions or bearing walls, uneven floor levels, poor delivery access, shallow depth of store, inadequate utility service, and lack of adequate and convenient parking. In studying the existing functional utility of a building, both curable and incurable items should be noted, with their cost to cure and an estimate of their negative influence on value.

Parking accommodations needed by a retail store facility vary according to location and type of business. In some cities, building or zoning codes now include minimum requirements. A ratio of one-to-one (equal amount of parking area to store area) is common. Shopping centers frequently have a parking ratio approaching three-to-one, or greater. Parking areas generally are surfaced with blacktop, and include drainage, lighting, marking, and bumpers. Adequacy of parking may seriously influence the value of retail store properties.

Studies* have shown that some formerly accepted standards for parking requirements may have been too severe. A 5.5 parking space per 1,000 square feet of gross leasable area approximates a 2.2-to-1 ratio. It has been suggested that this standard accommodates parking needs for all but the highest demand periods during the year. Office space and theatres may be added to the shopping center without requiring additional parking.

In older shopping areas, parking may be located in the rear of stores, accessible by driveway or alley; or else on nearby lots,

* *Technical Bulletin 53: Parking Requirements for Shopping Centers,* Urban Land Institute (Washington, D.C.: Author, 1965).

maintained as a community project. Merchants prefer to have parking in front for convenience and display value, and the greater desirability of front parking has been demonstrated by numerous surveys. The development of the free-standing store on an individual site as a satellite to a nearby shopping center is an outgrowth of the demand for more convenient parking. The parking ratio is usually equal to, or greater than, that of the shopping center. Such stores, which complete the variety of products and services available in a prime location, may have great customer drawing-power and special parking needs. Included are supermarkets, discount department stores, furniture stores, hardware building-supplies, automobile supplies and accessories, and restaurants.

Store rentals and leases are generally analyzed in terms of square foot of rentable area, with front foot relationships still applicable for downtown or similar street-front locations. The measurement of store buildings, varying with local custom, depends on the unit of comparison such as gross area or defined leasable area. The important consideration is that comparison be made on the basis of like compared with like. In addition to the similarity of areas, consideration must be given to services included in rentals, or to extra charges that must be paid such as common area maintenance charges in shopping centers.

Office Buildings

A primary measure of the efficiency of an office building plan is the ratio of net rentable area to gross area. The net rentable area of office space extends from the inside of the exterior wall or window-glass line to the inside of the corridor wall for multiple-occupancy floors. Corridors, restrooms, elevator lobbies, elevator shafts, stairways, and vertical facility duct space are excluded. For single-occupancy floors the gross area includes all except the perimeter walls beyond the glass line, the stairwells, elevators, and vertical duct space.

The efficiency (ratio of net rentable to gross area) of multiple-occupancy buildings formerly approximated 76%, with instances

of 80% in buildings constructed since 1920. This contemplates corridors sufficient to permit leasing the entire floor to numerous small tenants. Exceptions to the standard multiple-occupancy buildings are "one-sided" buildings, tower buildings, and buildings with large lobbies, wide corridors, and light wells. Buildings on awkwardly shaped lots usually cost as much per square foot to build as the well planned building, but have less rentable area and therefore a lower efficiency. For a single or major-occupancy tenant, such as corporate headquarters, the building which produces as much rentable area per floor as possible may have an efficiency as high as 90% or better. In multiple-occupancy buildings, a depth of 30 feet is about the maximum that efficiently accommodates small tenants. Elevator lobbies are usually 12 or more feet wide on the first floor, with a typical width for upper-floor corridors of 6 or more feet.

Prior to the advent of air-conditioning and high intensity lighting, space could not be deeper than 30 feet for two reasons: many cities required a fixed ratio between floor area and exterior window glass; and depths other than 30 feet were generally uneconomic to build. In order to comply with the required ratios, buildings were erected in various "alphabet" shapes. These Second Era buildings, 1919 to 1945, provided only about 25 foot-candles of light, included no air conditioning, and the heating was usually a two-pipe steam system with cast iron radiation. Men's and women's restrooms were frequently on alternate floors.

Office buildings since 1945 represent a different type of structure. They may be conventional with punched windows or with glass exterior walls. The latter type is more flexible, as the mullions are set on the modular lines, and all exterior private offices may have a full window. The most efficient module dimensions are from 4½ feet to 5 feet, but there are variations. Probably 95% of modern buildings have fixed glass, although there are certain cleaning advantages to pivoted windows. Lighting intensity usually approximates 85 to 100 foot candles. Floor loads are as high as 100 pounds per square foot owing to the desire on the part of cor-

porate tenants to utilize the space to its maximum capacity. Acoustic tile ceilings with flush fluorescent lighting are common.

Experimental architectural features, walls without windows, for example, or extreme setbacks of glass line in efforts to reduce air-conditioning costs, sacrifice rental area and obstruct view. If not economically practical, such features may result in functional inutility. Round, cross, and other odd-shaped buildings have not been generally satisfactory because of economic factors, including layout problems. An efficient design for square or rectangular floors involves a central mechanical core with service facilities available from the interior of the core.

Records have shown that the larger and higher buildings have made the best return over the years. On the other hand, a small office building is frequently in order, and in such event subscribes to the specifications of the larger buildings, although records indicate that for office buildings with a typical floor area of less than 10,000 square feet, the ratio of square feet to vertical facilities is disadvantageous, and generally the operating costs per square foot are higher.

In large cities there may be reduced necessity for providing parking space, but in the majority of other cities, where public transportation is meager or nonexistent, it would be most impracticable to build a large office building without owned parking facilities immediately adjacent to the office building or within it. The presence or absence of owned parking in any office building, and the practicability, efficiency, and economic effect of the inclusion of parking garage facilities within or adjacent to a large office building affect its functional utility.

The standard ceiling height for modern office space is 9 feet, but many buildings have been successfully rented with only 8½ feet. No buildings, apparently, have been built with ceilings in excess of 9 feet, except perhaps a few to meet unusual requirements. The larger the floor area, the closer to 9 feet should be the ceiling.

The exterior facia of the modern office building may be of many materials, such as stone, marble, porcelainized steel, porcelainized

aluminum, also sheet bronze, mosaic, glass, brick, and terra cotta. In the regions of severe frost conditions, terra cotta has proven unsatisfactory because water gets into open joints, freezes, and cracks the terra cotta tile, hence it is seldom used.

A strong tendency is growing to set the building back from the lot line and to install arcades, which tends to "open up" the downtown area. Many ordinances are so written that arcades are almost a necessity if an owner seeks maximum development.

To estimate the extent of obsolescence and functional utility in an office building, factors to be considered in relation to current standards include the following:

1. Ratio of net rentable area to gross area
2. Corridor widths
3. Ceiling heights and wasted space
4. Floor load design
5. Conventional or glass wall construction
6. Type of window with respect to vertical section, and whether of fixed glass
7. Allocation of lobby space
8. Efficient use of first-floor store or office space
9. Flexibility in layout of office space
10. Number, location, and size of restrooms
11. Elevator design, capacity, and probable remaining life before replacement is necessary
12. Adequate wiring capacity for lighting, office machinery, and power demands
13. Quality and design of heating and air-conditioning systems, or adaptability for an installation of adequate equipment
14. Parking adequacy and convenience
15. Location with respect to center of business activity in community
16. Image of building architecturally.

Industrial Buildings

Before 1925, most factories were built in urban centers. The employees either walked to work or used public transportation. Unlike steel and large assembly plants, most factories were centrally located on high-priced land, which resulted in multiple-story construction. The mill-type factory building had heavy masonry bear-

ing walls, timber columns and beams, heavy wood floors, 10- to 15-foot ceiling heights, elevators, and rail or truck docks. Column spacing provided for 10- to 20-foot bays.

The multistory reinforced concrete building appeared about 1910. It generally provided a concrete floor with columns about 20 feet on center and 9- to 12-foot ceilings.

Beginning about 1925, widespread use of automobile transportation made it practical to decentralize industrial locations. Utilization of less expensive land permitted one-story design plus adequate parking. For work-in-process, horizontal transportation by conveyor is usually less expensive and more efficient than vertical transportation by elevator. A production line or assembly process is generally more efficient at one level. Almost all new factory construction is single story, including mezzanine or upper-floor office space, and partial basements.

Technical studies† have disclosed the typical new plants' characteristics, some of which are listed below:

Location: Over 95% were in suburban or semi-rural areas.
Site: In one study, size ranged from 1 to 252 acres, with 80% between 13 and 100 acres. Only 5% made no provision for expansion, whereas 40% had surplus land.
Land-to-building ratio: 90% had a ratio of vacant land to building area of 5-to-1 or greater.‡
Bay size: Dimensions on center ranged from 16-by-20 feet to 150-by-500 feet. Fifty percent were 40-by-40 feet or larger.
Ceiling clearance: From 10 to 43 feet. Sixty-five percent were over 16 feet. However, for some special-purpose use, 20% were only 10 to 11 feet.
Employees per acre: Only 20% involved more than 30 persons per acre.
Setback: Distances ranged from 20 to 1,000 feet. Only 10% were less than 50 feet.
Zoning: Two-thirds were zoned industrial at purchase; one-third, unzoned or zoned after purchase.
Parking: The range was 1 space per 3 employees to over 1 space

† For example, Theodore K. Pasma, *Characteristics of 63 Modern Industrial Plants* (Washington, D.C.: U.S. Department of Commerce, 1966).

‡ This specific finding may be above typical in some areas.

per employee. Seventy percent provided at least 2 spaces for every 3 employees, and over 25% provided 1 space or more per employee.

Stories: Only 10% were more than one story.

Fuel: Two-thirds used gas for fuel, and 25% used oil.

Inbound deliveries: Trucks were used for half or more deliveries by 85% of the plants. Two-thirds used trucks for 85% or more deliveries. Rail service provided the remainder.

Outbound shipments: Two-thirds of the plants used trucks for shipments at least 85% of the time, with rail for the remainder.

Studies of this type tend to indicate the requirements for maximum efficiency. The predominant requirement is for a single-story building on a large site with ample parking. For most plants, good truck service and accessibility to major thoroughfares are required, with less dependence on rail service. The adequacy of truck and rail docks and other loading or unloading facilities may be an important factor in building utility. The increased use of fork-lift trucks permits industry to utilize higher ceilings and encourages larger clear-span bay areas.

The typical low-ceiling clearance of 30 years ago has risen to 16 feet or more. Bay size has increased from 20 feet to 40 feet square, or larger. Modern office area is well finished, lighted, and air conditioned, usually constituting about 10% of the space, varying with plant size and type of use.

Older buildings present many problems for the appraiser. The market clearly demonstrates that upper-floor space is generally obsolete, and elevators often are too small and too slow. In many cases, a low floor-load capacity limits the utility of the space. Bay sizes of 16-by-16 feet or less, and ceiling heights between 10 and 12 feet limit usability and indicate the existence of accrued depreciation due to functional obsolescence. Palletized operations generally require a minimum of 16 feet clearance with a current trend to substantially higher clear heights, permitting the use of improved machinery and handling equipment as well as new storage techniques.

As trucks have become larger, enclosed docks and loading areas

may be too small. The "spotting" and maneuvering of tractor-trailers usually requires at least 65 feet of clear area in front of docks.

In addition to its use for parking and loading, yard area is also needed for utility installations and storage. Experience has demonstrated greater desirability of a site which provides some room for future expansion, a feature often lacking in older industrial properties.

Among other important items to be noted are adequacy of sanitary facilities, lunchroom and locker-room area, lighting, water supply and waste disposal, sprinklers, fire hydrants, hose racks, power wiring, crane capacity, compressed air and other piping.

Many existing industrial plants are a combination of older and modern industrial design, with plant and office space that have been the result of expansion of a particular company. While such a complex may be adequately serving the needs of the existing occupant, it may have substantial obsolescence or functional inutility to typical users who are prospective purchasers. Even the more modern sections may suffer functional obsolescence from their combination with older buildings. In such a complex, the principle of contribution (to the value of the whole) is a guide in measuring the value of any particular component. Balance is also an important principle here, i.e., a viable relationship between the areas allocated to manufacturing, warehousing, employees' service areas, and office functions.

It is generally recommended that gross areas be used in referring to industrial buildings, and that outside dimensions be used in deriving the area of single buildings or a group of buildings taken as a whole. This applies to both single-story and multistory buildings, as well as entire floors used in multistory buildings. In cases where floors are subdivided among several tenants, inside measurements apply; space used in common, such as stairways, elevators, corridors, and toilet facilities, is excluded.

The history and development of warehouse facilities is similar to that of manufacturing plants. The single-story warehouse is

often more efficient than the multistory warehouse. The trend is to one-level floors, larger bays, and greater ceiling heights, with 18 feet or more prevalent in new construction. Docks and loading facilities are of major importance, with truck and rail docks frequently taking up an entire side of the building. Many warehouses are now arranged with the receiving function on one side of the building and shipping on the other. Load levelers, canopies, flexible accordion enclosures, and extensive heating and lighting are common at dock openings.

Extra land for expansion is important. However, parking facilities need not be so extensive as for the manufacturing building of similar size because there are fewer employees in a warehouse. The walls and frame may often be of lighter weight; the lighting, not so intensive; the office space, often less than 5% of the area; and heating and plumbing facilities, of simpler design and more limited quantity. However, floors and truck driveways must be of heavy construction and capacity. Since warehouse buildings usually are less expensive to erect, they rent for lower rates per square foot of area than do manufacturing plants of similar size. Hence, in developing unit costs, rentals, or market sales data, the appraiser differentiates between the two types of facility.

Another category of industrial improvement is the sales-and-service, or wholesale-and-distribution facility. These may be free-standing or in planned industrial parks; single occupancy or (frequently) multiple-tenancy facilities with self-contained rental units having offices (often 10%–35%) ; finished display areas; storage or work space; separate loading docks and separate sanitary facilities.

The appraiser measures and balances the floor space devoted to each use. From the point of view of functional utility, such buildings are simple in appearance, usually one-story in height, with an adequate amount of well-finished and air-conditioned office space, good receiving and shipping facilities; and they are usually well located with adequate parking.

Commercial Buildings

There are many types of commercial structures, frequently involving special purpose features, and all presenting different challenges and areas of research to the appraiser. Drive-in businesses, such as restaurants, dairy stores, dry cleaners, and banks, represent one category. These have a common need for a good location on major thoroughfares, correct placement on the lot, ample parking, driveways of adequate size and number, with well-placed curb-cuts.

The older parking garage usually consisted of a multistory building with 22- to 24-foot bays with ramps, and occasionally elevators. As cars became wider, the bay sizes were too narrow to accommodate three cars. Longer cars made it difficult to pull in, back out, or pass in the aisles. Ramps are often too steep for low-clearance cars, and often the turning radius is too short. Consequently, most of these older structures suffer a substantial loss in value, owing to functional obsolescence. The typical parking ramp may be a series of open platforms, substituting "stub" wall barriers for exterior walls, and no longer an enclosed and heated building. A typical functional garage may be multilevel, frequently with separate entrances for alternate levels so that only half the levels must be traversed to reach the top level. The typical bay is 55-foot clear span with no columns, and the cars are parked at 60-degree angles with marked spaces 8½ to 9 feet wide. Entrance and exit is by double spiral ramps. The pigeon-hole type of mechanical parking facility is a structure utilizing special car-moving equipment instead of ramps. Some parking decks with 2 to 3 levels, using a steel structural frame and precast prestressed floor slabs, have been designed to be taken down, moved, and reassembled. The unit term of reference for parking facilities is per car or per square foot of parking deck area.

The truck terminal is essentially an enclosed warehouse area having doors on each side of a heavy-duty floor at truck-bed height. There are usually offices, utilities, and washrooms at one end, and the roof may overhang to provide a protective dock canopy. Truck

terminal rentals are frequently considered on a basis of dollars per-door per-month or dollars per-square-foot of gross area. Similarly truck terminal sales may be expressed in relation to either door or square-foot units. In some areas climatic conditions and type of operation may eliminate the need for installation of overhead doors along the truck dock.

Older terminals were as small as 30 feet in depth (door to door), but this across-dock distance has gradually increased to 80 or more feet, to accommodate storage space and mechanical equipment for handling and transhipment of cargo. Usually 100 or more feet of parking, turning, and backing area are needed on each side, plus trailer storage area, scales, pumps, or other facilities. Many larger modern terminals include a separate garage building for service of the tractor units.

Farm Buildings

The amount of utility which farm buildings possess may have no fixed relation to their age or replacement cost. An old set of buildings could serve a farm as well as new buildings. The usefulness of the buildings is related to the type and size of the operation. This is so fundamental that the value of farm buildings is considered by buyer and seller in terms of how many dollars per acre the buildings add to the land.

The ratio of the value of farm buildings to all farm real estate has been declining since about 1940. Nationwide, the ratio dropped from 23.6% in 1960 to 21.0% in 1964, 19.7% in 1967, and 19.1% in 1972.

The average value of farm land and buildings per acre, the total value, and the total building value are shown by the following figures.[§]

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§ *Farm Real Estate Market Developments,* Economic Research Service, U.S. Department of Agriculture, July 1972, pp. 14–19, tabulation for March 1972, the most recent figures available. Estimates of total value reflect changes in acres of land in farms since the 1969 Census of Agriculture.

FARM PROPERTY, 1972

Region	*Value per Acre in Dollars*	*Total Value in Million Dollars*	*Total Building Value in Million Dollars*
Northeast	448	12,756	4,420
Lake States	309	17,948	5,594
Corn Belt	402	52,142	9,653
Northern Plains	131	24,021	3,361
Appalachian	322	18,648	5,883
Southeast	313	15,746	3,487
Delta States	302	12,528	2,990
Southern Plains	175	31,200	3,143
Mountain	74	18,993	2,170
Pacific	348	24,594	2,990
48 states:			
Average	217		
Total		228,575	43,693

The economics of farming and more advanced mechanical methods increase the acreage which one man can farm. This has resulted in larger land holdings.

When a contiguous farm is added to expand an operation, the new owner may have little need for the additional buildings. However, the vacant dwelling may be rented as a residence, and the expanded acreage creates a greater degree of utility for the primary set of farm buildings.

Since the average farm has been increasing in size, the farmer needs more and larger equipment. Therefore, the equipment sheds must be built to different dimensions. Often structures built some years ago have no further use. In dairying, the need for more ensilage calls for more silos, but with a corresponding lesser need for hay and straw storage. Also, baling permits more compact storage, so that often the large barns which were once necessary are too big, except when more acreage is to be added. The stable, with horse stalls and stanchion space for cows, is being replaced by the loafing shed and milking parlor. A stable with a low ceiling prevents use of modern equipment, such as the front-end loader.

Other Types of Buildings

Theatres

Theatres began to experience economic adversity as early as the 1930's following the advent of talking pictures, which required a change in the shape of the auditorium for optimum operation. The situation was later aggravated by the competition of television. With the decline in business, the cost of maintaining the larger theatres—especially the ornate, expensive "movie palaces" of the 1920's—became prohibitive. These older theatres were usually located downtown or in local business areas, where a further decline in attendance resulted from economic obsolescence, such as the lack of adequate parking, and deteriorating neighborhoods.

At the same time, there has been an increase in drive-in theatres, art theatres, and theatres in shopping center locations. The new theatres are generally smaller, functional, less lavish in design, and simply but well seated, also furnished with good air-conditioning systems. Newer houses are frequently free-standing buildings in or near shopping centers, benefitting from the adequate convenient parking. The unit of sales or rental comparison for theatres is usually a dollars-per-seat basis, but the square-foot unit is also used. Old abandoned theatres suffer substantial accrued functional depreciation because their special-purpose design limits their efficiency as theatres and makes them difficult to convert to alternate uses.

Service Stations

Automobile service stations have changed considerably in size, style, and character over the years. The sites are usually much larger, are on prominent corners, have more pump islands, and involve much more paved area. The buildings are somewhat larger than in earlier years, but most still consist of an office and sales area, with up to three service bays, including grease racks and a storage area for parts and accessories. A recent development is the

addition of a drive-through automatic external car wash which is free or on a discount basis with a gasoline purchase.

Many older, smaller service stations have been abandoned. New sites are created by purchase of obsolete improvements with substantial land area on prominent corners in urban locations. The old improvements are completely replaced by modern functional service stations. New locations near interchanges and off/on ramps of interstate highways are being acquired by the major oil companies. Another type is the cut-rate station, which specializes in selling gasoline only, with no service or repair facilities included.

The value of service stations is related to potential gallonage to be pumped, and the desire of major oil companies for representation at particular locations. Gallonage may depend more on location or entrepreneurship than on the functional utility of the improvements or site, which usually are fairly standard.

Hotels

Hotels have architectural style characteristics in common with apartments and office buildings. The new hotel buildings usually have a steel or concrete frame with exterior curtain wall of masonry or metal and glass panels. With few exceptions the rooms are larger, have lower ceilings, more windows, and decorating is better. The bathrooms are smaller, on interior walls, adequately ventilated, and generally include counter tops or dressing rooms and other features. The building is air conditioned with individual room-temperature controls. Often the main lobby has been moved up one level to provide retail space at the street frontage. Assembly and meeting rooms, dining rooms and ballrooms are arranged with folding walls to accommodate meetings of various sizes.

The success of the large hotel is usually tied to convention and meeting business. Commercial travelers and automobile tourists generally seem to prefer the convenience and free parking of the motels, either urban or suburban. For this reason, the meeting

facilities, restaurant capacity, and other services which relate to convention trade are important considerations in analyzing a hotel operation. The convention facilities of a city and of other hotels often are as important as the facilities within the hotel being appraised. Fundamentally, however, the hotel sells sleeping rooms, which may be booked by conventions far in advance. The physical facilities of the services and public rooms contribute to support the room rate and occupancy. The quality of management may be as significant as the physical facilities. Familiarity with standard hotel accounting practice and industry ratios is essential for competent analysis of a hotel operation.

Motels

The facilities offered by the modern motel have changed since tourist-court days. Catering to smaller conventions and meetings, some motels are equal to full-scale hotels with restaurants, meeting and assembly rooms, swimming pools, telephones, TV, and room services. Some of the new, large, multistory motels or motor-hotels seem to be growing away from the original motel idea, which was to offer comfortable rooms with minimum service but maximum convenience of arrival and departure. A good restaurant and coffee shop nearby or on site are necessary for successful motel operation. A location near major highways or thoroughfares for convenient access to the community is desirable. Appearance of exterior and landscaping are among the important considerations.

Since the small motel is less efficient from an operating point of view, most new motels have at least 100 units. The metropolitan motor-hotel of several hundred units is primarily indistinguishable from the concept of any major hotel, and is similarly analyzed in the appraisal process. Membership in a chain with a referral and advance reservation service is important in maintaining a satisfactory occupancy level.

The physical characteristics which are not functionally ideal in older motels are apparent when compared with newer ones. The term of reference for comparing one motel with another is gen-

erally the individual rental unit. Considered separately or included with this rental unit are the collateral facilities, such as those for dining, meetings, and recreation. Also acceptable is comparison on a square-foot basis. Competent management is assumed.

Summary

To estimate functional inutility in a building, the appraiser compares it with the typical modern functional building. All of the variations of the problem of functional utility and inutility (or disutility) cannot be dealt with completely in this textbook, but certain broad observations are made.

Most enterprises now need more efficiently developed space in which to operate. This generalization applies to industrial, apartment, hotel, office, theatre, and garage buildings. With few exceptions, sites involve larger land-to-building area ratios in order to meet building-line restrictions and to provide parking, loading, yard storage, and room for expansion. This applies to most types of industrial, commercial, or income-producing properties.

Structures with more functional dimensions are the result of two developments: the use of modern lightweight materials (steel and prefabricated prestressed concrete building framing and roof structures) and more efficient construction methods. New materials and more functional dimensions have resulted from improvements in the design and efficiency of equipment (heating, air conditioning, lighting, plumbing, power, elevators, and built-in fixtures). New types of material requiring less maintenance, and improved methods have rendered many older buildings obsolescent and functionally inadequate.

CHAPTER ELEVEN

Building Material and Equipment

THE APPRAISAL of real property usually involves the valuation of building improvements in addition to the estimation of land value. An adequate and competent description of the improvements usually precedes the valuation analysis, and comprises an important section in an appraisal report. A broad general knowledge of construction materials, methods, and equipment is desirable in order to prepare this description in a professional manner. In the appraisal of large properties or those with unusual characteristics, the assistance of an experienced construction man may be valuable.

The character, quality, and appearance of the construction are reflected in each of the three appraisal approaches to a value estimate. They have a major influence on the cost estimate, the accrued depreciation estimate, the ability of the property to produce rental income, and comparability with other properties in the market data approach. Construction methods and materials are almost as important as sound planning.

A structure may have good functional layout and attractive design, but be built with inferior materials and poor workmanship. These conditions increase maintenance and utility costs, and adversely affect the marketability of a property. Conversely, buildings can be built too well or at a cost beyond that justified by their utility. The loss, due to excess cost for which a purchaser will not pay, may be recaptured only in part through reduced future maintenance expense.

Economy of construction at a practical or reasonable level results in an improvement which, during its economic life, will produce a satisfactory rental income commensurate with its cost. Maintenance and operation expenses may be slightly more than minimum, but the net result is more satisfactory than if the building were of superior construction, calling for a higher level of taxes, interest, and amortization charges.

To achieve this desired level of construction cost requires a proper choice and use of building materials and construction methods. Upon inspection, the appraiser recognizes the appropriate combination which results in a building adequate to serve its intended purpose.

Climate

Since climatic conditions influence regional construction practices, they affect use of materials and architectural style. Neither the materials nor the styles typical of Florida and southern California would be functionally acceptable in New England. A house constructed along lines standard in the South would not be adequate shelter if built in Minnesota.

The same factors apply to commercial and industrial buildings. Climatic conditions affect the size and capacity of heating and air-conditioning equipment, also the size and depth of foundations. Driveways require a heavier base and material where subject to possibly severe frost conditions.

Availability of Materials

Availability of materials often is more of a determinant than climate. Because of longer life and lower maintenance cost, a house built of brick might be assumed to have greater value than that of a house built of wood. But the question arises: how available is the material? Brick in Augusta, Maine, might cost twice as much as in Chicago, while the cost of lumber in Augusta might be half the price in Chicago. In Augusta, a well-maintained house built of wood may have greater resale potential (at a price which

is consistent with its cost) than that of a house built of brick which was brought from a distance at great expense.

Sometimes unusual building materials, which are native to the region, influence the construction and style of the local buildings. For example, in the suburban Philadelphia area, a particularly attractive stone is readily available and well adapted for use in the construction of homes of all sizes. For generations, its use has been popular in houses of colonial or Georgian design. Another example is Lannon stone, a hard and colorful limestone quarried near Lannon, Wisconsin. In that area, its use is particularly popular for picturesque architectural types such as English, Norman, and French cottages. In California, redwood has been widely used for exterior finish; similarly, cypress is popular in the South. Almost every section of the country uses native materials in building construction. In judging materials and construction, the appraiser considers local conditions as they relate to climate, source of materials, popularity of types, and any other special factors which influence local construction practice.

Equipment

Both equipment and materials must be considered in the analysis of a building. Central heating and air conditioning, ventilation, and electric lighting provide artificial climate and daylight. Plumbing and water supply systems, elevators, communications equipment, and other devices provide additional services or comforts. As building equipment becomes more highly specialized, the structure tends to diminish in relative economic importance, and the equipment through which services and amenities are created becomes more important. For example, in a typical large office building, as much as 35% to 50% of the total cost of the building may be attributable to equipment. However, equipment is a primary source of depreciation in a proprety. Compared with the basic structural components, much of the equipment is shortlived. Thus, income-producing properties lose appeal to tenants when

competing properties offer newer and improved equipment and amenities. In the analysis of income-producing properties, operating and maintenance costs relate directly to the extent, quality, and design of the equipment. As equipment is properly or improperly selected and maintained, operating expenses may be higher or lower. Therefore the appraiser also studies equipment in his analysis of an operating expense statement, in planning to remodel or modernize, and in arriving at the general estimate of accrued depreciation.

A house or other structure may be overequipped or underequipped for its size or location. Overequipment might consist of the installation of a combination hot-water heating and air-conditioning system with individual unit convectors in each room in a small ranch house in a neighborhood where forced warm-air furnaces and window air-conditioners are typical. Another example might be the inclusion in a ranch house of an intercommunication system with AM-FM radio and with a microphone-speaker in each room, as well as stations at the front and rear doors. Overequipment usually is the result of a whim of the owner or builder. It should not be confused with the installation of practical devices that are in general use. More common than the overequipped is the underequipped building. The loss in its potential value is of minor importance if installation of proper equipment is practical. The study of one aspect of functional obsolescence is directed toward the proper balance between the structure and its equipment.

Some years ago, it was the fashion to install in houses bracket and ceiling lighting with comparatively expensive light fixtures. Later, the vogue was for movable floor or table lamps, requiring many convenience outlets in strategic locations. Items that seem insignificant may be extremely important to a prospective purchaser. A house, for example, frequently is judged by the smaller items rather than the large ones, especially by women who are influential in the final decision to purchase.

Building Material Analyses

Many obvious structural details tend to indicate the quality of the construction and of the materials used in a building. For example, a competition house built to provide maximum size and finish at a minimum cost may often be identified by such items as the following:

1. Cement asbestos shingles poorly installed, horizontal edges uneven, gaps in joints, corner boards instead of galvanized metal corners
2. Concrete basement wall rough because of dirty forms, snap-tie holes not pointed, rough form joints, top of wall uneven, wall poorly waterproofed
3. Minimum number of posts under a beam, posts not plumb or lacking a properly supported bearing-plate, beam not leveled and not pointed in wall, basement floor rough and not well troweled
4. Low grade of aluminum sliding sash, thin weak frames, low quality of glass and of screens, frame not made to mount storm sash, sash loose and poorly weatherstripped
5. Window frames badly set, poor caulking job, improperly designed lower frame member likely to cause stains on siding
6. Roofing poorly applied, large surface exposure, uneven lines, variation in color from mixed lots, uneven ridge line
7. Low quality floor joists, excessive knots (particularly at bottom), insufficient bearing at ends, high and low spots in floor, substandard bridging, single joist under bearing partitions causing sag
8. Use of ⅜-inch drywall, studs not properly trued, inadequate taping, poor nailing, badly sand-finished paint
9. Trim of low grade wood, full of knots, badly fitted, poor stain finish, inferior hardware, only one pair of butts on doors, defective oak floor
10. Low grade of valves, galvanized water pipe, minimum quality plumbing fixtures
11. Furnace with minimum BTU* rating, small sized heat ducts inadequate for future central air conditioning
12. Minimum capacity electric service, inadequate number of circuits, no spares, insufficient number of convenience outlets

* One BTU (British Thermal Unit) is the amount of heat required to raise one pound of water one degree in temperature (Fahrenheit).

13. Ceiling insulation below standard thickness, no wall insulation except fibreboard sheathing
14. Low quality and limited size of kitchen wall and base cabinets, minimum size cabinet sink with porcelain top, wall-mounted bathroom lavatory without counter or vanity.

This is only a partial list for one type of building. The appraiser becomes familiar with similar characteristics for various types of buildings. Usually the observation of such details leads to a sound estimate of the quality of construction.

Foundations

The foundation is the natural or prepared base supporting a structure. It may consist of wood posts, stone or concrete piers, a poured integral concrete slab with frost wall, or a reinforced concrete footing with concrete block, stone or reinforced concrete basement wall. Wood posts are subject to deterioration, and piers may sink if not properly designed and installed.

The basement wall generally is made of poured concrete, often reinforced with steel bars. It gives a smooth wall which can be painted and waterproofed. Unreinforced concrete block is subject to cracking, provides less resistance to outside earth pressure, and is more difficult to waterproof. No foundation can be better than the footing upon which the basement wall rests. A spread footing is all that is generally required for undisturbed, adequate load-bearing soil. Poor or filled soil may require poured concrete piers and grade beams. Adequate provision for drainage is essential for foundations to prevent water settling. Buildings without basements in cold climates require frost walls and insulation with the poured concrete floor slab, usually reinforced with wire mesh. Unexcavated areas may be enclosed by foundation walls to create crawl space for access to utilities.

In commercial and industrial construction, the walls, pilasters, and columns rest on reinforced concrete footings, or on reinforced concrete grade beams resting on pilings or poured concrete piers or

caissons. Interior columns may rest on spread footings or on piers or caissons. It may be necessary to consult building plans to ascertain foundation details.

Frame and Framing

The load-bearing skeleton members of the building constitute the structural frame. In wood residential construction, the outside walls are framed by vertical members called studs, resting on sills which are placed on, and secured to, the foundation wall. When the studs are cut at ceiling height, horizontal plates laid on top, and more studs continued upward for the second story, the house is *platform framed.* When the studs are continuous, notched to receive a horizontal member at the second-floor line, it is *balloon framed.* Either solid masonry walls or a steel beam may carry the principal interior bearing partitions. Employment of roof trusses has eliminated some of the need for interior bearing partitions, particularly in one-story structures, and makes possible larger living spaces. Wall members and specially constructed panels are often assembled in component sections in plants, hauled to the site, and raised into position.

When a house has solid masonry walls, the exterior wall is load bearing and substitutes for the frame. Since many "brick" homes are actually of brick veneer construction, with the same wood-stud frame as the wood home, an important consideration is the number and quality of the wall ties securing the brick veneer to the structural frame behind it. Air circulation is necessary behind the brick work to prevent dry rot.

In apartment construction, nonfireproof structures employ brick and other masonry bearing-walls with interior steel beams and interior fire walls where required. Some of the smaller types are built in the same way as brick veneer homes. Most of the larger structures are of steel frame construction with masonry or panel curtain walls. Completely fireproof apartment buildings usually have a poured reinforced concrete frame.

Hotels and office buildings generally are built in the same style as large apartments with either structural steel or reinforced concrete frame. Store buildings are usually steel framed, but may be concrete framed, particularly when multistory. Older store buildings may be masonry bearing or wood frame with wood roof structure.

Over the years, the structural design of industrial buildings has changed materially. Before the turn of the century, the multistory industrial or loft building was timber framed, usually with 12-by-12-inch or larger columns supporting wooden beams or joists. After 1900 steel began to replace timber framing and by 1910 many multistory industrial buildings were built of reinforced concrete with rectangular columns and beams and heavy slab floors. About 1920 round mushroom-capped columns under rectangular areas of heavier floor slab came into general use. Several other types of integral beam and slab, such as the tee-beam floor design with hollow-tile between the tee-beams or the use of pans to form beams or waffle patterns, became common, particularly for buildings requiring lower live-loads.

Precast units, frequently using prestressed reinforcing steel, are widely employed. Tilt-up construction utilizes precast concrete slabs, which may be lifted to a vertical position to become exterior bearing walls. The interior frame may consist of precast and prestressed concrete beams and columns with lighter precast slabs constituting the structural roof.

With the trend to functional, single-story horizontal operation, industrial plant framing usually is steel, with the bays (space between columns) becoming progressively larger. Bays 30 to 50 feet are common, and some aircraft plants have been built with over 100 feet clear span between columns. When the frame also supports heavy cranes, the weight and size of the structural steel members are increased.

Steel framing is usually less expensive and may be erected more rapidly than poured concrete. The disadvantages include the

necessity for painting, unless encased by fireproofing. This framing is also subject to bending and twisting in a fire, pulling adjacent members out of position. Reinforced concrete structures are slower to erect, but are relatively undamaged by fire.

Exterior Walls

Load-bearing walls in residences are usually solid masonry or wood frame with siding or some type of veneer surface. Solid masonry walls may be of face brick with a less expensive block backing or a cavity wall (brick plus air space plus back-up block), or in some cases poured concrete. Exterior walls for wood frame houses usually have sheathing (fibreboard, plywood, or boards) on the studs covered by material such as wood siding, composition siding, stucco, cement asbestos shingles, wood shakes, plywood with battens, brick or stone veneer, or aluminum siding. Some homes have extensive areas of wall ornamentation.

Wood and similar material require painting or other finish; brick and stone periodically need tuckpointing; cement asbestos shingles are relatively fragile and easily broken; and aluminum siding may be dented by hail or vandals. Climatic conditions, availability, local customs, and personal preferences govern selection.

There are three types of windows in common use: double-hung, various types of casement or pivot, and sliding sash. The frames and sash are wood, aluminum, or steel. In addition to noting the type, the appraiser judges their quality, workability, and inclusion of screens or storm sash. There has been widespread use of aluminum windows, many with three or four tracks, in areas where there is seasonal variation in temperature. Picture windows, large areas of fixed glass in wood or metal frames, thermopane glass, weatherstripping, and aluminum storm doors are widely used. Exterior doors may be of wood or metal, in panel or flush styles. Except in the most economical construction, exterior wood doors should be solid, although interior flush doors are generally hollow core.

Many commercial and industrial buildings use masonry walls, usually brick with back-up block or concrete block (which re-

quires some type of waterproofing paint). Where the wall is load bearing, usually masonry pilasters are integrated into the wall for structural strength. Most exterior walls are curtain walls (nonload bearing), made of porcelain enamel, steel, aluminum, precast aggregate concrete slabs, or glass. For industrial buildings, less handsome but serviceable materials are available, such as corrugated iron, tilt-up precast concrete slabs, asbestos board, fibreglass, and metal sandwich panels. It is important that longer walls and large roof slabs include expansion joints at reasonable intervals.

Most sash in commercial or industrial buildings is of steel. There is a trend to eliminate windows in many of the buildings that are air conditioned. Doors are usually of metal or metal and glass. Truck doors may be electrically operated to rise vertically. Show windows, entries, and store fronts are of glass, aluminum, and stainless steel construction. Many of this kind of building are very plain, except for the face exposed to traffic. In modern industry and commerce, the public image is considered so important that the exposed side of a building may be made very attractive in appearance, with ornamentation, identification signs, lighting, and landscaping.

Floors

The value of the premises is also affected by the structural design of the floor and its covering. The floor structure in most residences consists of wood floor joists bearing on foundation walls and beams. Floor sheathing of plywood is prevalent, instead of the one-inch boards formerly used. In some residences, steel bar joists support a thin concrete slab surface. In most rooms, except the kitchen and bath, floor finish is usually hardwood. It may be the traditional tongue-and-groove oak strips, parquet, or other kinds, such as hard maple, pecan, or ranch plank with pegs. The use of prefinished end-matched flooring eliminates on-the-job sanding and finishing.

Most kitchens have some type of linoleum, vinyl, or other resilient floor tile or sheet material, requiring plywood underlayment.

Many bathrooms may also have a resilient floor covering, but most have ceramic tile which is applied on a cement base over the sheathing. It is common practice to install some type of tile or resilient cover in entry halls.

The widespread use of wall-to-wall carpet has eliminated much hardwood flooring, since panels of plywood or similar material are used as the underlayment for the carpeting. Many homes include a family room, which may be the only one with hardwood flooring. In homes with concrete slab floors, or in homes without basements when the concrete slab floor is on grade, the finish may be terrazzo or resilient tile.

Basement floors should be a concrete slab poured over a proper fill (tamped sand, crushed rock, or cinders) on a well-graded surface with a sufficient slope for good drainage. More care is given to basement floors in modern homes because of the widespread use of basements for recreation rooms and workshops. The surface should be smooth, the joint between the floor and wall should be good, with adequate yard drainage away from the basement walls to minimize leaks and moisture. Portable electric dehumidifier units have greatly increased the use of basement areas.

The floors of porches, verandas, patios, and balconies should be pitched to drain away from the building. For appearance and serviceability, these floors are usually of concrete, but stone, brick, or wood may also be used. Metal decking may be utilized for balconies. Stone, brick, and wood may also be used for these floor surfaces.

In modern commercial and industrial construction, floors are usually of reinforced concrete. Floors on grade are usually concrete slabs on fill, with thickness and reinforcement depending on their intended use. Industrial floor surfaces are typically smooth and at one grade, to allow easy movement of materials. Such surfaces may include a hardener. Commercial floors are troweled smooth to take resilient tile covering, or they may be finished in terrazzo.

For lightweight floors the usual supporting structure consists of

steel bar joists resting on beams or bearing walls with a corrugated metal slab form or deck material. Over this structure is poured a concrete slab two to four inches in thickness with wire mesh reinforcement, and frequently using lightweight aggregate. Hollow concrete precast members may also be used as the floor structure. Such construction is common in motels and small commercial buildings. For medium floor loads, pan-type floor design may be used with integral reinforced ribs (tee-beams) which are part of the floor structure. For heavy floor loads and fire protection, floors may be heavy concrete slabs, reinforced with steel bars and mesh, poured integrally with beams and columns as part of the building frame.

Many older commercial and industrial buildings use wood joists, semi-mill and mill construction. Mill construction consists of timbers and planks placed in heavy, solid masses, so as to expose to fire the least number of corners or ignitable projections; and when fire occurs, to make it readily accessible to water from a fire hose. Accordingly, earlier joist and light floor construction was replaced by widely-spaced, heavy wood beams supporting heavier floor designs. Beams might be 12 by 16 inches supporting 3-inch thick tongue-and-groove planking, sometimes with a maple or other finish floor added to provide the working surface.

Interiors

Residential partitions are usually constructed of 2-by-4 studs with wall and ceiling surfaces of drywall or lath and plaster. Drywall or smooth gypsumboard, when of proper thickness and correctly installed on studs and roof trusses, makes an excellent interior surface, with most of the advantages of a plaster wall and few disadvantages. It is fire resistant, can be installed in less time than plaster, is relatively independent of winter weather, much cleaner, and introduces less moisture into a house during construction.

Where plaster is required or desired, rock lath (gypsumboard)

or expanded metal lath are generally used. The corners are usually reinforced with metal lath, and corner beads are used to protect edges.

Wallpaper and paint (including sand finish) are the customary finishes applied to drywall or plaster. There are endless varieties of each, and the materials are constantly being improved. Where hard wear, grease, moisture, or dirt are a problem, as in kitchens and bathrooms, tile may be used. Tile may be ceramic, plastic, or metal, and it may come in individual pieces, or sheets with the tile affixed to backing which can be removed after installation. Other materials are in the form of prefinished panels. Careful installation is important. There is widespread use of wood paneling, selected according to taste, style, and expense. Attractive effects can be achieved at low cost through the use of prefinished plywood, masonite panels, or other suitable materials.

Interior woodwork and trim in residences is usually of wood. If stained, birch and mahogany are generally used. If painted or enameled, pine and gum are fairly standard. Door frames are often formed metal for use with drywall. Doors are paneled or hollow-core flush design. Folding and sliding doors of various types have found increasing favor. Marble or formica sills are frequently used. Stairs in residences are usually of wood construction, and, if exposed in an entrance hall or living room, may be of attractive hardwood for treads with decorative railings and posts. Increasing the slope in an effort to reduce the floor area occupied by the stairway is often indicative of inferior construction.

The metal appointments of a building (such as the doorknobs, hinges, latches, handles) are known as finish hardware. The type used is a good indication of the quality of a building. A high grade of finish hardware neatly installed in a workmanlike manner usually indicates a well built structure.

The insulation of outside walls, under roofs, and over ceilings has become quite common. The full extent and type of insulation is sometimes difficult to discern except from plans. Fibreboard

sheathing (between studs and siding), which has been used for years instead of boards, has some insulating qualities.

A fireplace should be designed to have a good draft and a workable damper. It should have a hearth large enough to catch falling sparks. Masonry fireplaces require substantial foundations to carry the weight of the fireplace structure. Recent design has resulted in galvanized sheetmetal fireplaces with lightweight masonry linings and brick surfacing for the mantel and hearth, light enough to be included without a special foundation or wall. Such fireplaces, which may be installed in modern garden apartments and townhouses, with gas heating plants obviate the need for brick chimneys. Lightweight, double-thickness, galvanized steel chimneys may be used. Fireplaces and chimneys in older houses should be checked to make sure that they are well maintained in safe, usable condition.

In commercial buildings and in the finished areas of industrial buildings, nonbearing partitions may be constructed of wood studs, masonry, wood and glass, metal and glass, or steel studs with drywall or plaster. Modern construction frequently uses metal studs, with openings for pipes and conduits, to which drywall is fastened with sheet metal screws. This construction is widely used in remodeling. A variety of prefabricated modular partitions are available for use in office buildings, designed to be moved easily. Private offices may include any of a number of expensive finishes.

Ceilings are frequently suspended to allow space for utility pipes and ducts and for installation of flush or concealed lighting fixtures. Often the materials are acoustic and modular, so that panels can be easily removed for maintenance or remodeling.

The use of metal doors, trim, and door frames is common because of the reduced maintenance cost, desirable in commercial buildings. Finish materials, such as glazed tile, vinyl wall coverings, terrazzo, and other materials, are extensively used to reduce cleaning and maintenance expense. Hardware is usually simple and rugged for the same reason. Stairs in commercial and

industrial buildings are usually of steel or concrete, enclosed by masonry walls for fire protection. Most fire codes require two sets of stairs in public buildings.

Roofs and Drains

A roof—which includes its structure and cover—may be of various types, such as gable, hip, gambrel, mansard, shed, or flat.† The usual residential construction uses rafters, joists, trusses, or glued wood beams, with sheathing of plywood or boards. The structure must be adequate to support the cover material and to conform to climatic requirements, such as snow load and wind. The pitch of the roof should be appropriate for the roofing chosen.

Asphalt shingles are a common type of residential roofing in most regions of the United States, and are available in various weights. They may have cemented tabs to protect against wind damage. Slate and tile are more expensive and require a heavier structure for support. Wood shake shingles may curl, and carry a higher fire insurance rate. However, slate, tile, and heavy wood shakes often create a preferred architectural effect in better quality homes.

Flat roofs are pitched to drains or gutters. The built-up roof (tar and gravel, or composition) is rated by the number of piles, or layers of felt paper. Gravel or other surfacing helps to keep the roof from drying out and cracking. In commercial and industrial construction, the roof structure may be of steel or wood trusses, glued wood beams, or steel or concrete frame, with wood joists or purlins, or steel bar joists. Sheathing may be plywood, insulated sheathing in large sheets, steel roof deck, lightweight precast concrete slabs, or a reinforced concrete slab. Some type of insulation is used on most roofs. The usual roof cover is of the built-up type. The building design usually indicates the type of gutters or drains. Materials used for gutters and downspouts are galvanized iron, aluminum, and copper. In large structures,

† American Institute of Real Estate Appraisers, *Appraisal Terminology and Handbook* (5th ed., Chicago: Author, 1967), p. 171.

storm water is collected by roof drains, and conducted to the sewer by pipes within the building. Where there are gables or dormers, the valleys should have metal flashing of adequate width, properly installed. Openings through the roof, such as vents, pipes, monitors, and skylights, should also be correctly flashed and sealed to prevent collection of water and leakage. Where a flat roof meets a vertical wall, such as a perimeter firewall, counterflashing should extend from the wall back over the flashing.

Heating

The common types of residential central heating systems are warm air (forced or gravity), hot water, steam, and various types of electric heat. The rated capacity of a heating plant is usually expressed in BTU's (British Thermal Units). Forced warm air heat is widely used at the present time. Air is heated in a furnace fired by coal, oil, gas, or electricity, and is distributed through a single register or through ducts to the various rooms. Air circulation is maintained by means of a fan and a return duct system, which may include thermostats, filters, humidifiers, air cleaners, and air purification devices. In many areas, central air-conditioning equipment uses the same ducts as the heating system. Some earlier heating systems relied on gravity flow and involved the use of larger ducts with simpler distribution patterns, for circulation. Warm air plants are also used in some apartment construction, especially in new garden apartment or townhouse developments. Where gas is available for fuel, the warm air system may be used in a number of variations, including unit heaters, radiant gas heaters, wall or floor furnaces, and individual gas furnaces. Gas-fired heating units require adequate ventilation. All open-flame heating sources must have a supply of air sufficient to support complete combustion.

The hot water system basically consists of a boiler, radiators, expansion tank, and interconnecting piping. The system is filled with water which is circulated through the pipes and radiators where its heat is liberated, with the water returning to the boiler.

In general, the system is classified as gravity or forced circulation, with one or two pipes. Older installations were of the gravity circulation type. Newer installations use motor-operated pumps to improve circulation.

Radiant heating is the warming of floors or other surfaces by means of hot water, hot air, or electric heating elements. Through pipes embedded in the floor slab, side walls, or ceilings, hot air or water is circulated by means of a pump. Electric heating elements are similarly built into the structure. Lower temperatures are used in this system.

Steam heating uses radiators or other convectors in the rooms or space to be heated, and delivers steam or vapor from the boiler by means of a system of piping. The one-pipe gravity system is used only for smaller installations, with the radiator served by a single riser from the main pipe through which the condensate returns to the main. The two-pipe system is used for all larger installations. The term radiator is accurately applied only to the type of exposed fixture which heats by means of a combination of radiation and convection effects. The common cast-iron radiator is the best example. Improvements in steam heating have been developed to increase the operating efficiency of the standard arrangements through greater flexibility and temperature control. In large installations, zone control is used to overcome the effects of varied exposures in different parts of a building. Each zone has individual piping and controls.

Older boilers were usually of the cast-iron, horizontal section design, which was originally coal fired, and relatively low in efficiency. For larger installations, a vertical section cast-iron boiler was used. These units are more efficient and are covered with an insulated metal casing or jacket. Steel boilers are usually of the low-pressure fire-tube type in which combustion gases pass through tubes inserted into a cylindrical drum which contains the water. There were several types, which may be two-pass or three-pass construction for higher efficiency. Subsequently, small, effi-

cient "package boilers" found favor for heating and process-steam generating.

Finned heating elements, designed for installation in baseboards or concealed within walls or cabinets, are called convectors. The type which is combined with a fan is called a unit heater or room unit. In convector heating, air is heated in the enclosure and passes out into the room through the chimney effect created by the enclosure. The design uses a pipe or passageway for the steam with many surrounding fins to increase the air heating surface and to compensate for the fact that radiation as a means of heating is eliminated by the enclosure. The more attractive convector, which replaced the radiator, does not project into the room. The air discharged from the convector is lower in temperature than that heated by radiators and is more evenly diffused. This results in lower ceiling and wall temperatures and less heat loss through the walls.

In air-conditioned buildings, convectors may serve both as heating and cooling units with common piping switched from one system to the other at change of season, or in some of the installations with separate piping supply lines. Similar units may also be placed in duct systems' heating or cooling corridors or interior spaces in stores or office buildings.

Unit heaters are widely encountered in commercial and industrial properties, such as stores, industrial buildings, warehouses, and garages where large spaces are to be heated. Whereas radiators and convectors are placed along the lower section of the outside walls of a room and under the windows, unit heaters, which deliver fan-driven hot air, are placed near the ceiling in the interior of the space to be heated.

Automatic regulation of a heating system is important because it permits a higher degree of operating efficiency. In addition to the familiar single thermostat control, or zone control of various parts of a building, other systems include individual temperature control for each room. Apartment, commercial, and industrial

buildings' control systems may also include the thermostat mounted outside the building to anticipate heating requirements more quickly. Office buildings may be heated on the shady side while being cooled on the sunny side. Some installations are augmented by the use of heat from air passed over lighting fixtures.

Electric heating equipment includes the heat pump, wall heaters, or baseboard units with resistance elements, duct heating units, heat-cool units in which resistance elements are included with an air-conditioning unit, electric furnaces using forced warm air or hot water, radiant ceilings using panels or cable under the plaster, and infrared units which use radiant heat. The heat pump uses air, water, or the earth (by means of buried pipes) as the heating or cooling agent. Electrically heated houses require more complete insulation than is ordinarily used. The use of electric heat depends on the availability of electrical energy in quantity at low rates. This information is included in the feasibility studies that are generally prepared for large project installations.

Air Conditioning

Air conditioning of a building is merely one phase of the overall ventilation, which may include any or all of the following:

1. Simple removal of foul air with or without provision for entry of raw outside air
2. Mechanical circulation of outside air, preheating it in winter
3. Same as 2 above, with washing, filtering, and humidity correction
4. Summer air conditioning—cooling and dehumidification, separate from the heating system
5. Year-'round air conditioning—complete conditioning as in 3 above, with summer cooling and dehumidification added.

Ventilation alone in the first category may be accomplished with fresh air admitted through wall grills or through natural openings such as windows. The removal of foul air may be through outlets connected by metal ducts to roof ventilator heads with or without exhaust fans. Installation of the second and third types are forced warm air systems or indirect heating systems of the

plenum type. The simpler system is found in many homes and the more involved systems are found in older schools, theatres, and institutional buildings. A typical installation includes a fan, duct system, and heating coils or sections installed in the main duct. When conditioning is included, there is also a washer or filter to clean and condition the air.

The capacity of a central air-conditioning system is rated in tons or BTU's.‡ The two basic types are air cooled and liquid cooled. A gaseous refrigerant is compressed or condensed into liquid form by a compressor. This is circulated to a coil or evaporator where the liquid refrigerant is vaporized, lowering the surface temperature of the coil. Outside or recirculated air is fan-driven and cooled by passing over the finned coils. This may be in one large fan room or, instead, in many individual room units, depending upon the system. The vaporous refrigerant is then returned for recompression, after which it is ready to start another cycle. Heat generated in compression is dissipated by either an air stream or a liquid coolant such as water.

As in heating systems, there are many variations of ductwork and controls providing for zone control, the mixing in of outside air, removal of foul air, disinfection and freshening of recirculated air. Complete air conditioning can be incorporated with heating in a duct system. However, additional perimeter or spot radiation may be required to assure uniform, comfortable heating.

The ordinary window or sleeve through-the-wall air conditioner is air cooled. Package air conditioners for larger spaces not needing duct work are usually air cooled. Larger package conditioners with duct work and zone control systems are air or water cooled. Except where water is too expensive, the water-cooled system is preferred because it is quieter and uses less electricity. Water-cooling towers, often used for economy, recirculate rather than discharge the condensing water to a drain. Large installations may be extensive with compressors in the basement and cooling coils

‡ Twelve thousand BTU's equal one ton of air-conditioning capacity rating.

scattered throughout the building. For some installations such as motels or apartments, small individual units in each room or space are preferable for ease of maintenance and continuity of service. Whereas most installations utilize electrically driven compressors, gas also is used to operate air-conditioning units.

Plumbing

Plumbing systems consist of fixtures or equipment, which are visible, and piping (supply and drainage), which is often covered or hidden. The piping comprises a large part of the cost of the system. The durability of the pipe, the way in which it is installed, and its accessibility for servicing are significant factors with a very important bearing on an income-producing enterprise. Depending on type, the greater part of the pipe installation may last through the economic life of the structure. Galvanized steel and copper pipe are generally used for water service; cast iron, copper, or plastic pipe are used for drainage and venting above grade; and cast iron, below grade. Copper has become almost universally used in modern construction for supplying piping. Worn out galvanized piping systems often are replaced with flexible copper pipe.

The value of appearance is evident in plumbing fixtures and equipment in bathrooms and kitchens. Prospective purchasers or tenants are particularly critical of these rooms. New designs, developments, and types of use of bathroom and kitchen fixtures also merit careful consideration. Plumbing fixtures and buildings have relatively long lives, sometimes lasting through a number of fashion changes. Design changes are important because a fixture may be replaced before it is physically worn out. Modernization of kitchens and bathrooms is frequently justified for income-producing properties on the basis of improved economic value. Newer plumbing installations include more kitchen equipment, such as dishwashers, garbage disposers, and multi-compartment sinks built into base cabinets. Bathrooms utilize shower stalls and lavatories in countertops, in addition to the standard fixtures.

Hot water in a newer building may be supplied by a direct heater with or without storage tank, or in some cases by an indirect transfer heater connected to the steam-heating boiler. The usual residential water heater is an insulated glass-lined gas-fired or electric heater with large storage tank. The proper selection for any situation is an installation with sufficient capacity to supply the peak daily demand as well as the peak hourly demand. Temperature requirements may also be a critical factor in commercial installations such as restaurants or laundries.

Commercial and industrial buildings include drinking fountains, janitor's sinks, handwashing fountains, floor drains, urinals, and other special-purpose fixtures.

Electric Service

In well-designed structures, ample electric service is provided for light and power by capacity of service and the quantity and location of outlets. These facilities in older structures may be inadequate, and in violation of existing building codes. A history of continually increasing demand has demonstrated the desirability of service adequate for some future expansion. In residential construction, heavy capacity 3-wire, single-phase service of adequate amperage and voltage to the main panel allows for a requisite number of circuits to prevent dimming, low voltage, or overloads. Radios, television sets, clocks, floor lamps, light fixtures, heaters, furnaces, air conditioners, washers and dryers, and bath and kitchen appliances need sufficient outlets properly spaced and located.

Wiring is generally of nonmetallic cable (Romex), thin-wall, or rigid conduit. However, BX (armored cable) was widely used for many years; and exposed knob and tube wiring may still be found in some older homes. Circuit breakers are replacing fuses in panel boxes. Silent switches and low-voltage switching are more recent wiring. Lighting fixtures are the parts of a lighting system generally most subject to obsolescence and early replacement.

Fluorescent lighting (suspended, surface-mounted, or recessed)

is extensively used in commercial and industrial buildings. Often the design calls for continuous rows in large spaces. Incandescent fixtures may be used for smaller rooms, "accent," or other special purposes. In newer lighting design, the intensity[§] and quality of light at working and display surfaces are important considerations. Suitable degrees of intensity vary with the type of use. Sound planning usually calls for extensive use of floor outlets or floor duct systems in commercial and office buildings. These systems provide electric convenience outlets for office machines and telephone outlets at desk locations with a minimum use of cords.

Power wiring is used in commercial and industrial buildings to operate utility systems, appliances, and machinery. The electric power is generally carried at higher voltages (240, 480, 600 volts, or more) and is usually 3-phase or 3-phase-4-wire (which allows both lighting and 3-phase power loads to be delivered by the same supply). This wiring is carried in conduit or by means of plug-in bus ducts. Such overhead bus ducts are frequently encountered in manufacturing plants.

Miscellaneous Equipment

Fire protection equipment includes fire escapes, stand pipes and hose cabinets, some form of alarm service, and automatic sprinklers. A wet sprinkler system requires adequate water pressure to insure that the pipes are always filled. A dry system contains air in the pipes under pressure. When a sprinkler head opens, the pressure is relieved and water enters. This dry system is used where there is danger of freezing, for example, loading docks or unheated buildings.

Elevators are usually classed as passenger or freight, and are either electric or hydraulic in operation. Hydraulic elevators are suitable for low-speed, low-rise operations. Since attended passen-

§ Intensity is measured in footcandles of illumination. A footcandle is a unit of illuminance on a surface that is everywhere one foot from a uniform point source of light of one candle, and equal to one lumen per square foot.

ger elevators require full-time operator control, the high cost of operation has made this type obsolescent. The type, speed, and capacity of the elevator, as well as the number of floors served, are all related to the type of property and its utility. Most modern elevators are high speed, completely automatic, and have control systems to collect signals and distribute service among the elevators in the system. Some elevators have auxiliary controls for manual operation when required.

Signal, alarm and call systems, and similar devices should not be overlooked. Among other items to note are clocks, pneumatic tube systems, mail chutes, incinerators, screens, and storm sash. In smaller buildings, the telephone company supplies the wiring and equipment. In larger buildings, there may be extensive systems of cabinets, conduits, and floor ducts built into the building for telephone service.

Facilities for loading and unloading trucks and freight cars may be important in commercial and industrial buildings. Off-street loading docks are usually required by most zoning ordinances. These docks may be open or covered, and in many cases the floor of an efficient one-story industrial building may be above grade at freight car truck-bed level. In some cases, the docks may be enclosed within the building for both trucks and freight cars, and leveling devices may be provided to assist in loading or unloading. Proper industrial design provides adequate space in front of truck docks for maneuver of vehicles, as much as 70–75 feet to maneuver a 45-foot trailer, plus the length of trailers already standing at the dock.

Land Improvements

Many properties include paved driveways, parking areas, garages, walks, landscaping, as well as fencing and exterior lighting. Commercial buildings include large parking lots, signs, and light standards in addition to exterior or decorative lighting on the building. Large suburban industrial building sites are often extensively landscaped. Additional requirements may include large

parking lots for employees; loading areas for trucks; railroad spurs; underground improvements; and outbuildings for water supply, sewage disposal, utility services, or other purposes. The area is often fenced. Tanks and other structures may be included for heavy industries.

Condition Survey

To obtain a suitable basis for an estimated current reproduction (or replacement) cost, the appraiser writes a description of the building or buildings, other site improvements, and their condition. This description should enable the reader to visualize the existing buildings, as well as the site, the condition of the improvements, and their conformance to existing zoning laws and building codes. The amount of detail may be governed by the requirements of the report. The fact that building codes—fire, plumbing, electrical—may have been passed after the construction of the property makes it necessary to recognize nonconforming conditions.

From a survey of the physical condition of a building, the appraiser estimates the penalties, and notes and records the apparent accrued depreciation to be applied to the building or its components. This includes physical depreciation, items of deferred maintenance, and functional obsolescence.

Maintenance is considered with respect to age and utility. Buildings may be overmaintained or undermaintained. Repairs are made to maintain a state of usefulness—not necessarily to prolong the normal life of an item. In many undermaintained buildings, there may be deferred repairs. In other instances, buildings may be repaired to keep them in a suitable state of usefulness, or may be improved to attain a higher and better use. There comes a time when ordinary maintenance will no longer cure the inutility of certain parts of the building. In this case, improvements either may have been made or their advisability may be indicated. Generally, the distinction between a repair (maintenance) and an

improvement is that the improvement was or will be warranted economically by the production of additional income, whereas maintenance maintains existing income. (See the principle of Contribution in the chapter on Basic Principles of Real Property Value.)

Checklist

The character, quality, and condition of many construction details which are discussed in this chapter may be checked by reference to the following summary:

A. Foundation
   1. Excavation: quantity, type of soil, any special site preparation
   2. Footings and foundation walls: design, material, dimensions, drainage, construction; check plans if available

B. Structure
   1. Frame: type of construction; column or bay spacing; types of columns, beams, and floor joists
   2. Exterior walls: bearing or nonbearing; material, size, thickness, type of construction; window sash, doors, show windows, or panels; wall ornamentation
   3. Floors: floor structure: size and material of joists and sheathing, load capacity; floor cover: material; treatment of special purpose areas
   4. Roof: roof structure: size and material of joists, rafters, trusses and sheathing or deck; roof cover: type of construction, material and quality; drainage; design and material; flashing; insulation; monitors or skylights
   5. Interior construction: partitions: material and type of construction; finish materials: wall, ceiling, trim, doors, hardware; stairs: material and enclosure walls; special purpose areas

C. Principal equipment
   1. Heating and air conditioning: type of heating system: warm air, hot water, steam or other; type of radiation: wall, ceiling, floor, ducts, registers, radiators, fan units, convectors, unit heaters, etc.; kind of fuel and controls; air-conditioning systems: description and capacity; ventilation: method, fans, ducts, etc.
   2. Plumbing: material and size for supply and drainage piping;

the number of toilet rooms and fixtures; water service; sewage disposal; water heater; special purpose fixtures, such as janitor's sinks, drinking fountains, wash basins, floor drains, standpipes

3. Gas supply and piping
4. Electric services: type of wiring and service capacity, amperage and voltage; adequacy of outlets; type of fixtures; floor ducts or outlets; power wiring

D. Miscellaneous

1. Residential: built-in kitchen equipment: range, oven, exhaust fan, garbage disposer, dishwasher, bathroom heater, vacuum cleaner system, intercommunication system
2. General: fire escapes, standpipes, hose racks, screens, storm sash, shades and blinds, dumb waiter, wall beds, incinerators
3. Elevator: type, capacity, speed, number of doors, floors served, control system, design for construction of enclosure
4. Sprinkler: type (wet or dry), area covered, spacing of heads, reserve tanks
5. Commercial and industrial devices: clocks, alarm and call systems, pneumatic tube systems, mail chutes, loading docks and doors
6. Land improvements: parking areas: surface, base drainage; walks, patios, other paved areas; fences and gates; landscaping: lawn, shrubs, trees; signs, light standards, other exterior lighting; outbuildings, garages, sheds; pump houses, gas valve houses, canopies; water system, wells, sewage disposal system, sewers and manholes, septic tanks, treatment facilities, lagoons, etc.; railroad spurs; tanks; other structures.

CHAPTER TWELVE

Building Cost Estimates

EACH OF THE APPROACHES has applicable methods to arrive at indications of value. The cost approach to value consists of land value (as though vacant) to which is added the depreciated cost of all improvements. Basic to arriving at a figure for the latter is an estimate of their reproduction cost new, as of the date of appraisal.

There is an important distinction between reproduction cost (new) and replacement cost (new), which is shown by the following definitions:

REPRODUCTION COST—The cost of creating a replica building or improvement, on the basis of current prices, using the same or closely similar materials.

REPLACEMENT COST—The cost of creating a building or improvements having the same or equivalent utility, on the basis of current prices and using current standards of material and design.

Reproduction cost, although representing the basic concept, is sometimes difficult to estimate, because identical materials are not available or construction methods have changed. Then the use of replacement cost provides a practical alternative. It represents the required funds to erect an equally desirable substitute property, not necessarily constructed with similar materials or to the same specifications.

For example, reproduction cost for an older structure erected with 21-inch brick bearing-walls and unnecessary belt courses, coignes, corbeling, or cornices would be computed on the basis of identical design erected today. On the other hand, an estimate

of replacement cost would not necessarily imply a structure of identical appearance. The nonessential or obsolete features would be omitted; probably a reinforced concrete or structural steel frame with 13-inch block and brick, or perhaps 9-inch curtain walls, would be substituted for the 21-inch brick bearing-wall at a lower construction cost. Accordingly, by use of the replacement cost as opposed to the reproduction cost, some of the obsolescence or inutility present in the building would be streamlined out of the replacement cost estimate before deduction for accrued depreciation. An accrued depreciation penalty for this functional obsolescence owing to the thick walls would represent a correct deduction from reproduction cost new, but if charged against replacement cost, the effect is to double this component of depreciation, since the additional cost of the 21-inch wall is not part of the initial estimate. It is not logical to deduct depreciation on anything not included in the cost estimate. Therefore the use of replacement cost as opposed to reproduction cost may represent a short cut, for it eliminates functional lack of utility due to excessive cost (of an obsolete building). Since reproduction cost and replacement cost are not synonymous, the terms should not be used interchangeably.

Importance of Reproduction Cost

Separate valuation of improvements is needed for many of the same reasons which require a separate land valuation: for tax purposes (where ad valorem tax laws dictate this separation in value); for accounting (where it is desired to reflect depreciation of buildings); to estimate the most profitable use of land; to ascertain the amount of return attributable to the improvements when using the land residual technique; and in feasibility studies for conversion or renovation programs.

Further, a basic reason for the estimation of building cost, apart from land value, is the broad subjective principle that buyers will not pay more for something than it would cost to duplicate

it. In appraising, this is one application of the principle of substitution.*

The cost of reproduction is not necessarily equivalent to value even when a building is new. It may not represent the highest and best use of the site, or it may involve built-in obsolescence owing to defects in design, or there may be a loss in value on account of other adverse factors. Any of these may cause a deviation between the cost to create and value as defined in terms of the relationship between a thing desired and a potential purchaser.† However, combined with a proper estimate of depreciation, reproduction cost new is the foundation for the cost approach to a value estimate.

Methods of Estimating Reproduction Cost

Comprehensive reproduction cost estimation requires preparation of a detailed inventory of the materials and equipment which comprise the improvements, and then applying to this the current prices of similar materials, equipment, labor, overhead, and fees necessary to duplicate the property as of the appraisal date. Reproduction cost may be obtained in this way; but in actual practice it is more frequently derived by shortcut methods which are adequate, since the most competently prepared building-cost estimates are still subject to reasonable variation.

Although prices of materials and wage scales for labor usually can be determined for any date, the resultant cost of combining them in a completed building cannot be predicted with certainty. The profit incentive (or lack of it) is a strong influence which can raise or lower the cost estimate. This is illustrated when contractors are invited to submit bids. Frequently cost estimates on the same set of specifications may vary substantially. The contractor who is working at capacity is inclined to make a high bid,

* See chapter on the Basic Principles of Real Property Value.
† See chapter on the Nature of Real Property and Value.

but the one whose program is slack may submit a lower figure.

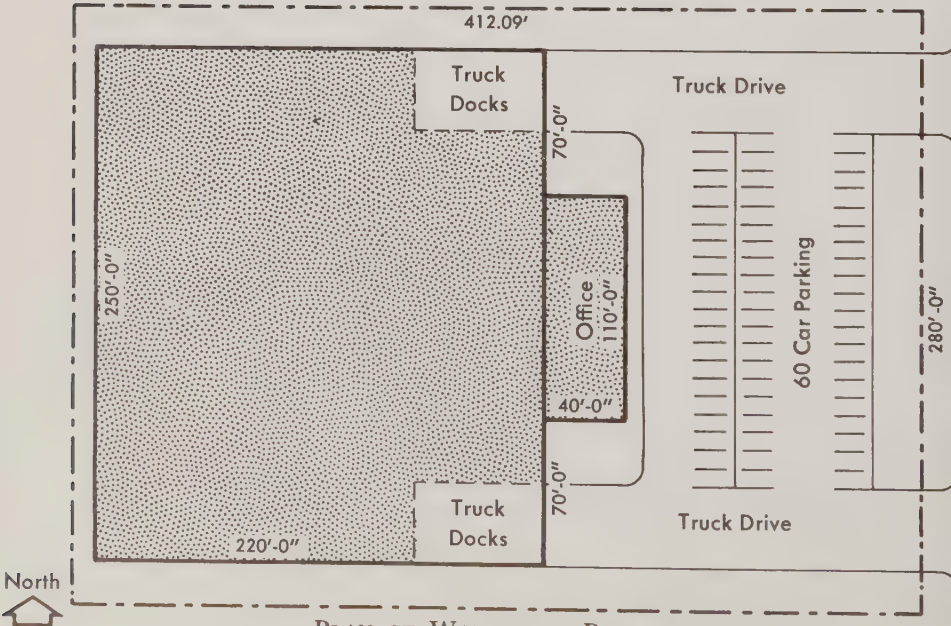
Quantity Survey Method

This is the most comprehensive method of cost estimating and, in its strictest application, is a repetition of the contractor's original procedure of determining the quantity and quality of each type of material used, estimating labor hours required, and applying unit costs to the material and labor quantities. Although still an estimate, the quantity survey is the most accurate and provable method of cost estimating. It produces a reproduction cost estimate in detail sufficient for any possible requirement.

Application of this and other methods are shown here as they might be applied to the following typical office and warehouse structure.

WAREHOUSE PROPERTY
PRICING EXAMPLE ONE—QUANTITY SURVEY APPLICATION

Area	*Square Feet*
Office	4,400
Warehouse	55,000
Total building	59,400



PLAN OF WAREHOUSE PROPERTY

Specifications and general description of this building are:

Office area: Heated, with air-conditioning equipment rated at 15 tons; ceiling height, 9 feet; flooring, asphalt tile over concrete slab; illumination, 60 footcandles intensity, fluorescent lighting; ceiling, acoustic tile; partitions, stud and drywall. Two washrooms, containing six fixtures.

Warehouse area: Heating to 65° at —10°; clear ceiling height, 18 feet; bays, 41½ feet by 36½ feet; structural steel framing; insulated roof deck over steel bar joists; 6-inch concrete floor slab at grade; electric service, 600 amperes, 120/240 volt. Four overhead wood truck doors. One washroom, containing three fixtures.

Exterior bearing walls are brick and block; interior columns, steel; flat steel roof trusses, steel deck; rigid insulation, built-up tar and gravel roofing. Structure is fully sprinklered. Other details are typical.

A summary of the contractor's cost breakdown‡ for this improvement might be as follows:

Permits	$ 2,430
Excavating	14,248
Concrete	64,407
Carpentry	9,744
Masonry	68,077
Structural steel, Joists, Deck, Deck erection	92,105
Roofing	26,832
Sash	1,426
Glazing	3,808
Truck dock	3,931
Painting	2,038
Acoustical material	1,741
Flooring	759
Electricity	22,118
Heating, ventilation, air conditioning	26,192
Piping	1,863
Plumbing and sprinkler system	38,494
Overhead and profit	29,435
Total	$409,648
Rounded	$410,000

‡ Based on a breakdown of labor and material—not included here.

Based upon the preceding summary, an appraiser may estimate reproduction cost new at $410,000. Note that this example is not in itself a complete quantity-survey breakdown, but represents a recapitulation of the cost estimator's quantity survey analysis. Items above, not subcontracted, need to be computed by the estimator on the basis of estimated labor hours at prevailing wage levels plus material quantities at current delivered cost to the contractor.

In recent years the percentage of a general contract that consists of subcontract work has been increasing. Subcontract workmen become more efficient in their specialty, and subcontract unit-in-place cost compares favorably with the cost at which the general contractor could accomplish the work with his own men. Each contractor and subcontractor has his own breakdown of material, labor, indirect costs, overhead, and profit items, which are part of the total estimated cost.

Overhead and profit are variables depending, among other things, on the volume of work the contractor may have in prospect. Contingencies, not listed above, represent another category, particularly if renovation is involved. A contractor may also allocate his anticipated profit among the various components of cost, rather than as a separate item, in a cost breakdown available to an appraiser.

The quantity survey procedure leading to the cost breakdown as presented here is time-consuming and costly for a specific appraisal, and its preparation requires the services of an experienced cost estimator. The individual appraiser, however, may accumulate available quantity survey cost breakdowns for various types of improvements. With suitable adjustment for physical differences or for time, these breakdowns provide a sound basis for estimating the reproduction cost of reasonably similar improvements, through the process of direct comparison.

The cost estimate for the warehouse given in the example above constitutes the basis for a general contract bid; the figure of the accepted bidder, plus any other separate contracts, constitute the owner's direct cost for improvements. However, direct

cost does not normally represent total cost to an owner in process of improving his property. Hence, the appraiser must also estimate indirect costs on the basis that they typically add to the total cost of construction. Indirect cost, as discussed in the chapter on the Cost Approach, may include architectural and engineering fees, soil borings, taxes and insurance during construction, construction loan fees, interest during construction, permanent financing costs, legal fees, title costs, and similar necessary expenditures.

Unit-in-Place Method

Because the use of detailed quantity cost surveys may not be necessary except for special assignments, the appraiser may take advantage of less detailed methods of estimating cost. One of these is the *unit-cost-in-place* method, also known as the *segregated cost* method. It is based upon the use of unit prices for the various building components, using workable units such as the square or lineal foot, or other appropriate basic unit. On the basis of the actual quantity of brick required per square foot of wall, a unit price may be obtained. This may be applied on the basis of square feet of wall or of lineal feet of wall of a certain height. The developed unit cost of brick per thousand in place, for example, is composed of the cost elements for labor, overhead, and other items incident to the erection of the building. The same procedure is followed for other components of the structure. With this method, a detailed bill of labor and materials is not necessary.

Such unit cost estimates are made, in terms of standardized unit costs installed, for various components, including floors, roof, plumbing and heating units, excavating, plastering, and foundations. For roofing, the basic unit is a square (100 square feet); for a foundation, a cubic foot or cubic yard of concrete; for an excavation, a cubic yard. The unit-in-place upon which the cost is based may be the one used in a particular trade, such as cost per ton of air conditioning, or it may be any selected basic unit of measurement. These unit-costs-in-place are assembled for use in estimating the cost of an entire improvement.

Provided that the units accurately reflect cost, this estimate, used instead of an actual quantity survey, is a shortcut. The resulting figure should correspond in accuracy with that derived from a quantity survey.

An illustration of this method is a cost estimate for a brick veneer wall. Assume the exterior walls above the foundation are 4-inch face brick tied to impregnated 4-by-8-foot ½-inch sheathing on 2-by-4-inch studs, 16 inches on center, with insulation between. The stud wall has ½-inch drywall on the inside, painted with two coats of lead and oil. Assume that this wall is 17 feet high to the cornice line; further, that for each square foot of wall surface, 7½ bricks are required. Such unit prices exclude architects' fees, and may or may not include some typical overhead and profit margins. In using such unit prices, it is important to ascertain exactly what they include. Assume that the following unit prices[§] are developed for such a wall:

Face brick, installed; common bond, ½ in. struck joints, mortar included	$340 per 1,000 brick
Dimension lumber in 2 × 4 in. wood stud framing, erected	$360 per 1,000 board feet
Sheathing, erected	$ .24 per square foot
Insulation, installed, 2½ in. foil backing, one side	$ .12 per square foot
½ in. drywall with finished joints	$ .27 per square foot
Painting, primer and one coat flat paint	$ .13 per square foot

On this basis an estimate of the cost per square foot of wall might be:

7½ bricks	$2.55
½-foot board measure wood studding	.22
1 square foot sheathing	.24
1 square foot insulation	.12
1 square foot drywall	.27
1 square foot painting	.13
	$3.53

Therefore the estimate for a wall 17 feet high would be $60 per linear foot.

§ Such figures vary according to time and location.

By this method, the cost is estimated, without detailed quantities, for an above-ground exterior wall, including the interior finish. The base unit figure covers the greater percentage of the cost of the total wall.

In actual practice, the estimator may refine this procedure. He may add for waste and extra framing, and give recognition to the existence of windows and doors (requiring wall openings, lintels, facing corners, etc.) with a resulting increase or decrease in the basic unit cost. Once basic unit figures are established, the cost of an entire building can be estimated expeditiously.

The unit-in-place procedure (method) breaks down the cost of a building into figures for component surfaces and parts. The cost estimate in this form is adapted to the appraiser's needs for various purposes, such as recording condition of components or computing the cost of replacements. However, the process of assembling basic costs of equipment, material, and labor, and their combination into the final unit-cost-in-place may require specialized knowledge. If completely developed, this procedure may be a useful substitute for the quantity survey method of estimating the probable reproduction cost of a building.

Unit-in-place cost estimates may be based on the appraiser's compiled data, and are also available through certain cost estimating sources that provide updated monthly figures.

The following is a simplified application of this unit-in-place method to the same warehouse example used for the contractor's cost breakdown in the section, Quantity Survey Method.

WAREHOUSE PROPERTY
PRICING EXAMPLE TWO—UNIT-IN-PLACE (SEGREGATED COST) APPLICATION

Area	*Square Feet*
Office	4,400
Warehouse	55,000
Total building	59,400

An estimated reproduction cost of the building, using the unit-in-place (segregated cost) method, might be calculated as follows:

ESTIMATED COSTS★
(figures are rounded)

Excavation	
59,400 cu. ft. @ $ .21	$12,470
Foundation	
59,400 sq. ft. @ 75% of $ .40 = $ .30	17,820
Floor—concrete	
59,400 sq. ft. @ $ .79 + $ .14 waterproofing = $ .93	55,240
Floor—cover, asphalt tile	
4,400 sq. ft. @ $ .31	1,360
Ceiling—acoustical tile, wood fiber	
4,400 sq. ft. @ $ .45	1,980
Plumbing—2 washrooms	
9 fixtures @ $350	3,150
piping, drains, etc. (for 4,400 sq. ft. @ $ .20)	880
Sprinklers	
59,400 sq. ft. @ $ .54	32,080
Heating, cooling and ventilating—forced air	
55,000 sq. ft. @ $ .25	13,750
4,400 sq. ft. @ $2.40	10,560
Electricity and lighting	
55,000 sq. ft. @ $ .32	17,600
4,400 sq. ft. @ $ .71	3,120
Exterior wall, 8 in. concrete block, brick	
20,400 sq. ft. @ $3.29	67,110
Partitions, 2 × 4 in. wood stud, 16 in. on center, painted	
8,650 sq. ft. @ $1.25	10,810
Overhead doors—6	
10 ft. × 12 ft. × 6 = 720 sq. ft.	
720 sq. ft. @ $6.00	4,320
Roof—steel columns, joist and deck	
59,400 sq. ft. @ $1.50	89,100
Roof cover and insulation	
59,400 sq. ft. @ $ .45	26,730
Miscellaneous	
59,400 sq. ft. @ $ .19	11,290
Total♦ (from rounded figures)	$379,370

★ Marshall and Stevens Publication Company, *Marshall Valuation Service,* (Los Angeles, CA: Author), Segregated Cost Method, Section 44, January 1972, pp. 1–5; Section 99, February 1972, pp. 3, 6.

Assume that this estimated cost of $379,370 must be adjusted (multiplied by .98) to bring the figure to current cost from the date as of which the unit-in-place costs were estimated, and must also be adjusted (multiplied by 1.09) for the effect of location (city, community, or area) on the estimated unit prices. (Such adjustments would be calculated as follows: $379,370 × .98 = $371,780, and $371,780 × 1.09 = $405,240.)

Total (from above estimated costs)	$379,370
Current cost multiplier	.98
	$371,780
Local cost multiplier	1.09
Indicated reproduction cost	$405,240

This indicated reproduction cost of the building in its location and as of the current date, rounded to $405,000, when compared with the contractor's estimate of $410,000 (Pricing Example One) shows a difference no greater than might be anticipated between contractors' bids.

Comparative Methods: Square Foot and Cubic Foot

The comparative methods, widely used for appraisal purposes, represent a somewhat simpler, practical approach to a cost estimate. Both of these methods are based on unit cost figures applicable to gross building dimensions. Each is a method of estimating total cost by comparison with that of similar buildings, the costs of which are known and have been reduced to units per square foot of gross floor area or per cubic foot of building content. In applying these methods, the number of square or cubic feet contained in the building under appraisal is first computed.

Measurement. Outside measurement is used to compute the number of square feet that a building contains. It is customary to state the dimensions as width *times* depth, the first figure being the width or frontage. Projections are added, and insets subtracted.

♦ The unit-in-place (segregated cost) method, as here applied, includes in each unit figure a pro-rata share of costs such as material, labor, contractor's overhead and profit—but excludes architect's fees.

The gross area of a building is normally the sum of the gross areas of all floor levels. However, in some localities, dwellings are figured in terms of square footage of ground floor coverage. In others, the area is the gross square feet of living space; on this basis, a two-story house, 24-by-24 feet, with unfinished basement and attic, has an area of 1,152 square feet ($24 \times 24 \times 2$).

To estimate the cubic feet of space in a building, width is multiplied by depth and by mean height (outside measurements). The mean height is measured from six inches below the basement floor surface to the mean height of the roof. The concept for measurement is a cube. Thus the mean height of a gable roof is one-half the distance from the top of the ceiling joists to the ridge; the mean height of a hip roof, one-third of this same distance. If the building does not have a basement, the method of cubing is the same, except that the height is figured from one foot below the top of the first floor, or from grade, whichever is lower.

The advantages or disadvantages of the square-foot versus cubic-foot method must be judged in terms of local tradition, custom, and individual choice. The square-foot unit is sometimes preferred, particularly for single-story structures. Generally, the square-foot unit is less flexible, although not necessarily more inaccurate, because costs are affected substantially by ceiling heights, roof pitches, and similar elements. Although these factors are difficult to incorporate in the square-foot method, it is widely used and is ideally applicable to warehouses, loft buildings, store buildings, and similar structures. The cubic-foot method frequently is applied to apartments and office buildings; that is, to structures with a considerable degree of interior finish and partitioning.

Comparative Unit Cost Estimate

This is the simplest means to estimate the reproduction (or replacement) cost. Under the comparative methods, the actual costs of similar buildings are divided by the number of cubic feet or number of square feet of floor or ground area, resulting in a unit cost per cubic foot or per square foot.

The comparative unit cost varies materially with size. It reflects

the fact that plumbing, heating units, doors, windows and similar items do not necessarily cost proportionately more in a large building than in a smaller one. If a similar cost is spread over a larger area or cubic content, the unit cost obviously is less.

Unit costs for benchmark buildings found in cost estimating manuals usually start with a base building of a certain size (that is, a base area or volume), with additions or deductions according to the actual number of square or cubic feet involved. As a building becomes larger in relation to the benchmark building, the unit cost decreases. Conversely, a building smaller than the reference building tends to cost more on a unit basis.

Because few buildings are exactly the same in size, design, and grade of construction, the benchmark building rarely is identical to the one being estimated. Variations of roof design, and irregularity of perimeter and of building shape affect the comparative unit cost, sometimes to a substantial degree. As an example, for a building 100-by-100 feet, the cost of walls alone, per square foot of ground area enclosed, may vary substantially from that of one 40 by 250 feet, although each encloses the same area. This is shown by the following:

EFFECT OF SHAPE (WALL RATIO) ON COST

	Building A	*Building B*
Building size	100 × 100 ft.	40 × 250 ft.
Area enclosed	10,000 sq. ft.	10,000 sq. ft.
Linear feet of wall	400	580
Wall ratio◊	25/1	17.24/1
Cost of wall		
per linear foot▲	$30	$30
total cost	$12,000	$17,400
per square foot of enclosed area	$1.20	$1.74

This makes it apparent that in order to develop a reliable conclusion through application of the comparative methods, the unit cost must be properly adjusted to reflect variables such as size,

◊ Ratio of the number of square feet of area enclosed to each linear foot of enclosing wall.

▲ Assumed.

shape, finish, equipment, and other attributes of the building, and also to reflect cost level changes occurring between the date of the benchmark unit cost and the date of valuation.

The apparent simplicity of the square-foot or cubic-foot comparison method can be misleading. Dependable unit cost figures require the exercise of care and judgment in the process of comparison with similar or standard structures for which actual cost is known. Inaccuracies may result from selection of a unit cost which has not been properly related to the property under appraisal. However, correct application of this procedure will provide estimates of reproduction or replacement cost which are reasonably accurate and entirely acceptable in appraisal practice. The use of square-foot or cubic-foot cost estimates involves a program of assembling, analyzing, and cataloging data on actual building costs. These detailed costs should be classified in general construction categories, such as warehouses or office buildings, with separate figures for special finish or equipment, e.g., sprinkler systems. An over-all square-foot or cubic-foot unit cost can then be broken down into its component elements. This, in turn, is helpful in adjusting a known cost for presence or absence of items in later comparisons. Several publications are available that provide square-foot and cubic-foot cost pricing units, some with periodic updating for different types of construction.

The same building, which was used as an example in the preceding sections on the quantity survey method and the unit (segregated) cost-in-place method, is shown below to illustrate application of the comparative unit-cost procedure using an established cost service:

WAREHOUSE PROPERTY△
PRICING EXAMPLE THREE—COMPARATIVE UNIT-COST METHOD

Area	*Square Feet*
Office	4,400
Warehouse	55,000
Total building	59,400

△ The specifications and general description of this building are given in the section, Quantity Survey Method.

Estimated Costs		
Comparative cost□ per sq. ft.	$5.18	
Add 10% for superior grade	.52	$5.70
Add for sprinklers		.55
		$6.25
Current cost multiplier (adjusts benchmark cost to date of valuation)		1.05
		$6.56
Local cost multiplier (adjusts standard manual cost to specific city)		1.09
		$7.15
Less architect's fees (included in above at 4.5%)		×95.5%
Cost (exclusive of architect's fees)		$6.83
59,400 sq. ft. @ $6.83		$405,702
	Rounded	$406,000

This figure is close to the $410,000 derived from application of the quantity survey method, and confirms the $405,000 figure of the unit-cost-in-place method. The estimated costs under all three methods are well within the anticipated range of contractors' estimates. The accuracy of these methods varies with the complexity of the building and the skill with which the estimator adjusts for differences.

The above example shows the application of the comparative method on a square-foot basis, using a published cost service.□ This procedure may be used to confirm a cost estimate based upon actual cost data for similar structures, but when such data is not available, it may be used alone. If the actual cost of a similar building, or buildings, in the same construction market can be ascertained, the appraiser reviews the physical description of the structure for which data is available and adjusts for specific differences to derive a cost estimate for the property being appraised.

□ Marshall and Stevens Publication Company, *Marshall Valuation Service* (Los Angeles, CA). Sec. 14, April 1971, p. 13; Sec. 44, January 1972, p. 4; Sec. 99, Feb. 1972, p. 3. Contractor's overhead and profit are included in these base costs. As architect's fees are also included, they are here deducted, to make this cost estimate uniform with previous pricing examples in this chapter, in which architect's fees were excluded.

Cost Data File. A comprehensive current cost data file is part of the appraisal plant. It includes cost information for such classes and types of buildings as meet the appraiser's need. It may also include data on current costs for material and labor, and cost information on such structures as residences, apartments, hotels, office buildings, commercial and industrial buildings, built of frame, steel, brick, and concrete construction, or combinations thereof. A system of grading quality of construction may also be used in order further to refine the data. In accordance with existing building codes, cost of materials, and the wages and practices of labor, construction costs vary in different localities.

A file of this kind provides a check against probable costs of reproducing or replacing an existing building, as well as against known or projected costs for existing or proposed buildings of varying types and classes. It also provides a check against the probable cost of different components of a building, and of various trades of work involved.

For example, assume as a benchmark house a two-story brick residence that cost $23,600 to build three years ago, exclusive of detached garage or other site improvements. Assume that the quality of construction is roughly comparable with that of an average mass-produced home with asphalt shingle roofing, ½-inch drywall, good average finish and equipment with combination forced-air heat and air conditioning, plus a dishwasher, disposal, and fireplace. Included are three bedrooms, two-and-a-half baths, and full basement, 22-by-34 feet on the ground floor plus basement. This residence contains 22,440 cubic feet and 1,496 square feet,** thus costing approximately $1.05 per cubic foot or $15.77 per square foot of gross area.

Assume that the appraiser is preparing a cost estimate for a house roughly comparable to the above. In contrast to the bench-

** The appraiser may elect to compute the basement area separately at an appropriate square-foot unit cost.

mark house, this house has a concrete block foundation in lieu of poured concrete, no fireplace, and a good grade of wood siding instead of brick exterior walls. The appraiser makes downward adjustments for these differences: $1,600 for wood siding, and $125 for the block foundation, and a further deduction, $900—no fireplace. Unit costs are now $0.93 per cubic foot and $14.02 per square foot. If contractor's overhead and profit are not included in these unit cost adjustments, their total may be increased by an additional 15%–20%.

Assume that the cost of construction has risen 12% in the last three years. This is reflected by increasing the $0.93 unit cost by 12% to $1.04 per cubic foot, and $14.02 per square foot becomes $15.70. Now let it be further assumed that the house under appraisal contains 24,700 cubic feet and 1,648 square feet of gross area.

Application of the derived current cubic- or square-foot unit costs to this property results in a current cost estimate of $25,709 or $25,874, respectively. These estimates are likely to be called $25,700 and $25,850 or $25,900. This minor difference is probably due to a small variation in size, ceiling height, roof pitch or roof design, which slightly altered the average height. This differential however, does point up the fact that cubic-foot and square-foot methods do not always produce identical estimates. The following table summarizes this procedure:

COMPARISON AND TIME ADJUSTMENT

	Benchmark House 3½ years ago	*Estimated Current Cost of a Comparable House*
Cost	$23,600	$23,600
Adjustments:		
Wood siding		—1,600
Block foundation		— 125
Fireplace		— 900
Estimated reproduction cost (as of 3½ years ago)		$20,975

COMPARISON AND TIME ADJUSTMENT—Continued

	Benchmark House 3½ years ago	*Estimated Current Cost of a Comparable House*
Area, square feet	1,496	1,648
Volume, cubic feet	22,440	24,700
Cost per square foot	$15.77	$14.02††
per cubic foot	1.05	.93
Time adjustment		
To present		+ 12%
Estimated present reproduction cost		
per sq. ft.		$15.70
per cu. ft.		1.04
Total		$25,900‡‡

Application of the comparative unit cost method to a residence in the example above is no different in principle than its application to any other type of improvement.

The discrepancy may be substantial between a one-story warehouse with a 14-foot ceiling height and one with a 20-foot ceiling height. Thus, in the use of cubic-foot or square-foot unit costs, it is essential that their application be to very similar structures.

Composition of Unit-Cost Figures. Building cost estimates should include all costs. The cost of materials delivered on the job plus the cost of labor to assemble materials into a finished structure is basic, but indirect costs also must be considered. There may be two kinds of indirect costs pertinent to cost estimating: first, the contractor's overhead and profit (which is normally included in his contract and may then be considered part of direct cost), architect's fees and other outside professional services, taxes, insurance, administrative expenses, and interest on borrowed funds during the period of construction. Second, for income-producing properties, there may be additional costs incurred after completion of construction, while tenants are being secured and until average

†† $20,975 ÷ 1,496 square feet.

‡‡ 1,648 × $15.70 = $25,873; 24,700 × $1.04 = $25,688.

occupancy is attained. Indirect costs vary according to the circumstances prevailing at the time of construction.

The ratio of equipment to the basic building shell cost has been consistently increasing over the years. Equipment tends to increase unit building costs and it also tends to depreciate more rapidly. In consequence, the knowledge of the composition of the cubic- or square-foot cost unit not only assures better cost estimates, but also assists in estimating depreciation. The condition of the finish may be judged; and with good maintenance, the basic structure may last indefinitely; however, the equipment may require replacement in a foreseeable number of years.

In addition to estimating the cost of main buildings, other individual estimates are needed for improvements, such as garages and various outbuildings; or for land improvements, for example drives and paving, pools, underground drainage, rail sidings, fences, or landscaping. These may be individually estimated from applicable unit prices, on a square-foot, square-yard, or lineal-foot basis. Such comparative unit costs may be developed, applicable to any situation.

Cost Services and Indices. There are available recognized cost reporting services. Some include illustrations of typical structures and provide adjustments to tailor the standard example to differently shaped or equipped buildings, as previously illustrated. Some provide adjustment for individual cities or areas. Some show cubic-foot costs, some square-foot, and some are designed for unit-in-place information. In addition to good cost services, it is useful to have actual knowledge of local construction costs. Extensive use may then be made of these services to confirm estimates developed from local cost data.

Also useful is a cost index service which reflects the relative cost of construction over a period of years. When the actual cost of a building constructed some years ago is known, application of the index will indicate the present construction cost, provided the actual cost was a typical figure. For example, assume that an apart-

ment house cost $217,600 to build in January 1958. Assume, further, that a 1958 cost index, from a national service which uses 1926–29 as the base, is 284.4. The April 1973 cost index is, say, 596.3. Based upon this data, the building should cost 2.097 times its January 1958 cost (596.3 index divided by 284.4 index), or an indicated cost of $456,300[§§] in April 1973.[★★]

The difficulty inherent in this procedure is that the reported original cost may not represent a typical cost; and it may also be difficult to ascertain what components are included and what may be omitted in the reported original figure. Updating an historical cost provides a useful method of confirming a cost estimate, but it is not necessarily a substitute for other methods. Capital expenditures for improvement, subsequent to original construction, must also be taken into consideration insofar as they represent additional construction. They may affect also the separate estimate of accrued depreciation.

Summary

Separate valuation of the improvements and the land, in the cost approach procedure, is needed for many reasons, including ad valorem taxation, accounting, highest and most profitable use estimates, feasibility studies, and application of certain residual techniques in appraisal.

The cost approach comprises an estimate of land value (as though vacant), to which is added the depreciated cost of all improvements. Basic to the latter figure is an estimate of reproduction cost new or replacement cost new.

Reproduction cost is the sum of money needed to construct a new replica of the improvement. Replacement cost is the cost of reproducing a substitute improvement which has equivalent utility. Since reproduction cost and replacement cost are not synonymous, the terms should not be used interchangeably.

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§§ Figure is rounded.

★★ E. H. Boeckh & Associates, *Boeckh's Manual of Appraisals* (6th ed., Washington, D.C., Author, 1963), p. 39.

American Appraisal Company, Inc., *Boeckh's Building Cost Index* (Milwaukee, WI, Author), March–April 1973.

The cost of reproduction usually is not the equivalent of value even when a building is new, for it may not be the highest and best use of the site, or it may have built-in functional obsolescence owing to defects in design. The alternate use of the replacement cost to reproduce a substitute improvement of equal utility may streamline out of the cost estimate some functional lack of utility in the existing building.

Therefore the use of replacement cost, as opposed to reproduction cost may be a shortcut in eliminating the cost of most of the overadequate construction. When depreciation is applied to *replacement cost* in the physical approach, care must be taken not to apply an additional accrued depreciation penalty for such functional obsolescence, because it is illogical to deduct depreciation for anything not included in the cost estimate.

Of the methods available for estimating cost, the most comprehensive is the quantity survey method, which shows the quantity and quality of each type of material used, and estimated labor hours required. Although still an estimate, the quantity survey is the most accurate and provable method of cost estimating.

Also available for the estimation of replacement cost is the unit-in-place (segregated cost) method, which is based upon the use of installed prices for various building components, in terms of square-foot, linear-foot, or some other unit basis. This method is simple in application, but if the units are accurately developed, it provides a reliable substitute for the quantity survey method.

In the comparative square-foot or cubic-foot method, which is widely used in appraisal practice, these unit costs of reproduction for a comparable or benchmark building are ascertained. Adjustments are made for variations between this standard and the property being appraised, in order to arrive at a reliable unit reproduction cost estimate.

Reference to a cost index service makes it possible to bring known costs of a structure up to date, which is also a useful check against estimated current cost. A record of actual building costs, properly classified and broken down to a square- or cubic-foot basis for use in the comparative method, enables an appraiser to achieve

reasonably accurate cost estimates in minimum time. In comparing and applying unit figures, it is necessary to recognize cost differentials caused by such factors as perimeter of the buildings, number of exterior corners, total linear feet of interior partitions, and extent and quality of mechanical equipment. Because these items can raise or lower the unit cost, appropriate adjustments are required. The accuracy of the comparative method depends primarily on the skill of the estimator in understanding and adjusting for these differences.

Building cost estimates should include both direct construction costs and indirect costs. Direct costs are those for material and labor, generally including the contractor's or subcontractors' overhead and profit, whereas indirect costs include professional services, developer's overhead, also carrying costs during construction and until normal occupancy.

The appraiser recognizes acceptable sources from which he can obtain cost estimates, and limitations of available methods.

CHAPTER THIRTEEN

Accrued Depreciation

THE ESTIMATION of accrued depreciation is an essential step in the cost approach. A competent estimate, no matter how briefly presented or summarized in an appraisal report, must be predicated upon a comprehensive understanding of the nature, components, and theory of depreciation as well as practical and academic concepts for estimating its extent in improvements under appraisal.

Depreciation has been defined* as follows:

> DEPRECIATION . . . An effect caused by deterioration and/or obsolescence. Deterioration is evidenced by wear and tear, decay, dry rot, cracks, encrustations, or structural defects. Obsolescence is divisible into two parts, functional and economic. Functional obsolescence may be due to poor plan, mechanical inadequacy or superadequacy, functional inadequacy or superadequacy due to size, style, age, or other. It is evidenced by conditions within the property. Economic obsolescence is caused by factors external to the property, such as inharmonious property uses.

Note that depreciation includes loss in value from all causes and that deterioration and functional obsolescence relate to deficiencies within the property itself, whereas economic obsolescence is due to environmental factors.

Depreciation represents a deviation from an initial standard of value. The basis of the cost approach is the current value of the land under its highest and best use, plus the current reproduction cost of the improvements; and from this standard, depreciation is

* American Institute of Real Estate Appraisers, *Appraisal Terminology and Handbook* (Chicago: Author, 1967), p. 56.

measured. Hence, only the improvements are subject to accrued depreciation as of the date of appraisal, and its measure is the difference between the current reproduction cost and the current value of the improvements.

On the assumption that improvements represent highest and best use with no initial obsolescence,† they generally have full value in terms of cost only at the moment of their completion. Depreciation begins at this point—although not usually at a constant rate—owing to physical deterioration and obsolescence. At the point when an improvement cannot be profitably utilized, or when it no longer contributes to the value of the property, it is at the end of its economic life, and depreciation is 100%. At this point it is a penalty upon the land value equivalent to the cost of removal.

In the cost approach to a value estimate, the appraiser is concerned with the extent of currently existing loss in value, which is accrued depreciation. Such accrued depreciation is a fact. It differs from provision for anticipated future loss in value in the income approach, i.e., recapture of investment, which is discussed in the chapter dealing with the income approach.

Accrued depreciation (past depreciation) is the loss in value which has already taken place up to the date of appraisal. It is loss in value from any cause, estimated from inspection of the property and analysis of the neighborhood (environment). It constitutes a deduction from reproduction (or replacement) cost new to derive an estimate of the depreciated cost of the improvements as of the date of appraisal. Accordingly, accrued depreciation may be defined as:

1. The actual depreciation existing in the improvements at a given date; or
2. The difference between the cost of reproduction new of the improvements, as of the date of appraisal, and their present value.

† Obsolescence may be built into the design of the structure.

The distinction between the terms "reproduction cost" and "replacement cost" (as noted in the preceding chapter and in the context of their use in this chapter) should be clearly understood, since the use of replacement cost in lieu of reproduction cost as a basis for the cost approach may affect the estimate of accrued depreciation.

Reproduction cost is defined as the cost of creating a replica building or improvement on the basis of current prices, using the same or closely similar materials.‡ In certain cases, materials may no longer be available to reproduce an existing structure, or new construction techniques and materials may make it possible to build a structure of equal utility at a lesser cost than that to reproduce the identical design with the same construction materials used in the property being appraised. In such case the appraiser may begin with replacement cost new (cost for a building of equal utility) and depreciate from this base.

The use of replacement cost in lieu of reproduction cost does not change the principle of estimating physical deterioration. However, some calculations may be eliminated in estimates of certain types of functional obsolescence frequently encountered in outdated structures (such as overadequacy of construction). Consequently, it is frequently desirable to estimate accrued depreciation for an outdated building in relation to estimated replacement cost of a more modern structure rather than in relation to the reproduction cost of a building identical in all respects to the original. (See discussion of functional obsolescence, incurable.) In eminent domain appraising, the use of reproduction cost is sometimes preferable, thus avoiding the necessity to explain the rationale of replacement cost.

Depreciation may be estimated directly through observation and analysis of the components of depreciation affecting the property, or through use of a formula based upon physical or economic age-

‡ Defined in chapter on Building Cost Estimates.

life factors. Accrued depreciation may also be estimated indirectly by use of the income or market data approaches.

Indirect Methods of Analysis

In using the indirect approaches, the difference between a value estimate based upon reproduction cost new and the value estimate indicated by a market data or income capitalization approach to value is a measure of loss in value from all causes, or accrued depreciation as of the date of analysis.

This may be illustrated as follows:

		Indicated Property Value	
		Market Data Analysis	*Income Capitalization Analysis*
Estimated reproduction cost as of date of appraisal	$400,000		
Land value	80,000		
Total	$480,000	$400,000	$390,000
Difference or indicated accrued depreciation as measured by loss in value		$ 80,000 (20%)	$ 90,000 (22.5%)

These two figures indicate an amount of accrued depreciation as derived by the market data and the income approaches respectively, and the indicated percentages relate these figures to the estimate of reproduction cost new.

Figures so derived may be used in support of an estimate of accrued depreciation. However, exclusive use of these indirect methods of analysis effectively reduces the appraisal process from three[§] approaches to two. Despite recognition of interdependence between all three approaches, the development of each as independently as possible is normally preferred, and the appraiser is thus

[§] Cost, market, and income.

constrained to consider some direct method of analysis to derive his estimate of accrued depreciation. A direct method is also essential for developing an estimate of accrued depreciation in the cost approach when the property under appraisal involves a type of improvement not normally bought, sold, or rented in the market, and for which there is a lack of market and rental data.

An effective indirect method of analysis for estimating depreciation is a variation of the market data analysis illustrated above. In this method, sales of properties similar to that being appraised are analyzed. The analysis of a typical sale might be as follows:

Sale price of property	$50,000
Less land value	10,000
Indicated improvements value	$40,000
Computation of depreciation	
Reproduction cost of improvements	$60,000
Less indicated improvements value	40,000
Indicated depreciation	$20,000

The amount of the depreciation in this example is 33.3% of the reproduction cost. Assuming the improvements were 10 years old, the average annual depreciation would be 3.33%. Similar analysis of other sale properties might indicate a range in average annual depreciation of 3.0% to 3.5%, and could provide a basis for estimating the depreciation applicable to the improvement being appraised.

Application of this method of analysis is limited when there are no sales of comparable properties, as in the appraisal of special-purpose or other unusual improvements and in periods of market inactivity. Despite this limitation, the method may provide a valid approach to a depreciation estimate. Since the appraiser is usually seeking market value, an analysis based upon market factors may be significant. The study of depreciation as reflected in actual market situations is also valuable in developing a background for the use of more subjective methods of analysis when market data is not available.

Direct Methods of Analysis

These direct methods are based primarily upon observation which may be combined with a straight-line or age-life formula or with an analysis of the components of depreciation.

Straight-Line Method

The straight-line concept may be applied on the basis of a physical life or an economic life projection.

Physical Life. The straight-line basis for estimating accrued depreciation assumes that physical deterioration occurs at a constant average annual rate over the estimated life of the improvements. If, for example, it is assumed that a building has depreciated on a 100-year basis, physical depreciation has accrued at the rate of 1% per year ($\frac{1}{100} = .01$), and estimated depreciation at the end of 30 years is 30%. This percentage is then deducted from current reproduction cost new to arrive at a physically depreciated cost estimate. The assumption that depreciation accrues at a constant annual rate may not be generally valid because of variables in use patterns, maintenance standards, and renovation programs which vary from one building to another and from one period to another in the life of a structure.

Depreciation due to physical factors alone may accrue at a rate substantially below the 1% of the above example, if a structure is well maintained. If it experiences no destructive forces, such as tornadoes, earthquakes, floods, or wind storms, and if it is protected against fire or other major casualty loss, physical life may be considerably prolonged.

Component Physical Life—Engineering: A refinement to the above concept involves the application of individually estimated levels of accrued depreciation to the separate components of the structure—such as foundations; walls; floors; plumbing; electric, heating and air-conditioning systems; elevators and other mechanical equipment. Also known as the engineering concept, it necessitates a more detailed inspection of the improvements, and must be predicated upon a reasonably comprehensive cost analysis such as

a quantity survey or unit-in-place cost breakdown. These are frequently difficult to secure, particularly for older improvements. Accrued depreciation is estimated for each component based, insofar as possible, upon observation.

Applied to a 10-year-old structure with an estimated basic physical life of 100 years, a condensed example follows:

COMPONENT PHYSICAL LIFE—ENGINEERING

Building Component	*Reproduction Cost New*	*Estimated % Deterioration*	*Accrued Deterioration◊*
Excavating	$ 17,250	10	$ 1,720
Concrete	74,410	10	7,440
Carpentry/Interior finish	11,480	20	2,300
Masonry	68,080	12.5	8,510
Structural steel/joists	42,180	11	4,640
Roof deck	15,470	11	1,700
Roofing	20,830	50	10,420
Sash and glazing	5,030	20	1,000
Truck dock	3,930	50	1,970
Painting	2,040	10	200
Flooring	760	50	380
Electricity	18,120	20	3,620
Heating, ventilating and air conditioning	24,190	45	10,890
Plumbing/sprinkler system	39,960	20	7,990
Parking area	6,460	20	1,290
Subtotal	$350,190		$64,070
Weighted average $64,070 ÷ $350,190 =		18.3	
Permits/Overhead/Profit★	$ 31,860	× 18.3 =	$ 5,830
Indirect cost estimate	47,500	× 18.3 =	8,690
Total	$429,550		$78,590
	$430,000	and	$79,000♦

◊ Rounded.

★ If overhead and profit were included in and/or pro-rated among the individual breakdown figures above, this computation would be unnecessary.

♦ This figure could be rounded to 79,000, or called $78,500 for subtraction from a $429,500 total. The 18.3% estimate of accrued depreciation could also be called 18.5% or 18%, either of which is within the reasonable range of the judgment decisions leading to the final estimate.

The deterioration estimates above may reflect the appraiser's observation that there has been recent repainting, the parking lot has been resurfaced, and maintenance is generally good, but that the truck dock has received rough treatment. The total estimate exceeds a straight-line relationship with the estimate of basic structural life because of mechanical equipment and other relatively short-lived components which represent a substantial percentage of modern construction. Individual judgments applied to each item based upon observed condition should be more reflective of actual deterioration in a specific property than are over-all averages for an entire building; but since many items are not visible, their condition must be postulated from an understanding of typical situations.

The straight-line pattern as described above, applied either to the entire structure or by engineering components, should produce a reasonable estimate of accrued physical deterioration. The use of depreciation estimates so derived falls within the objective concept or cost-to-create philosophy which is basic to the cost approach.

However the statement that "more buildings are torn down than fall down" implies that the estimation of physical deterioration may be insufficient as a measure of the loss in value from all causes. Therefore considerations of functional and economic obsolescence should be separately provided for, in order to arrive at a reasonable estimate of accrued depreciation from all causes and to recognize the effect of subjective concepts on prospective purchasers' opinions of value. Deficiencies inherent in the improvements (functional obsolescence) or external factors which offset the desirability of the property in the market place (economic) must also be considered by the appraiser if the indication of value derived from the cost approach is to have significance for reconciliation with the indications of value derived from the market data and income approaches. Lacking such consideration, the cost approach estimate is incomplete, reflecting only a physical concept of value.

Economic Life Basis. In order to provide for these subjective elements of accrued depreciation within the concept of the straight-line method, economic life instead of physical life may be used as a basis for computations of accrued depreciation. This is common practice; a percentage estimate so derived reflects all components of accrued depreciation (physical, functional, and economic), but includes them on the basis of their *average* effect as may be indicated by experience surveys for specific types of property. Various tables of experience data have been developed from these surveys to indicate reasonable economic life expectancy or the characteristic rates of depreciation according to the type of construction—as frame, brick, steel, reinforced concrete; and the type of property—such as apartment, industrial, commercial, office buildings, or service stations.▲

The utility of any empirical depreciation table depends on its basis and applicability to a particular property and purpose. Some tables represent physical deterioration only, while other tables△ are based upon economic life and reflect the average effect of economic and functional obsolescence as well as physical deterioration. Some depreciation tables add refinements by including separate percentages to reflect the poor, fair, or good condition of a building. Nevertheless, no table, however carefully derived from average experience, can effectively replace the appraiser's justification of accrued depreciation in a particular property, based upon his judgment and experience, his observation of the existing condition of the property, and his analysis of its functional and economic attributes.

In the use of these tables, effective age□ rather than chronological age should be the guide. Structures may have been remodeled, reconditioned, or rebuilt since the date of their erection. They

▲ An example of such tables appears in Marshall and Swift, *Marshall Valuation Service* (Los Angeles, CA: Author, looseleaf service).

△ U.S. Treasury Department, Internal Revenue Service, "Depreciation Guidelines and Rules" (Washington, D.C.: Government Printing Office, 1964).

□ Explained in detail later in this chapter.

may have had better or worse than average maintenance. Also, unusual functional or economic obsolescence may be present. Consequently it may be necessary to adjust from a straight-line figure to reflect conditions applicable to the property being appraised. One concept involves estimating effective age, with the ratio of effective age to typical economic life reflecting the measure of accrued depreciation. This application of the age-life concept recognizes that valuation is concerned with future benefits rather than actual age.

Physical versus Economic Life Expectancy: Illustrations of the computation of depreciation utilizing various age/life relationships follow:

Actual Age/Typical Economic Life
Assumption: A typical improvement is considered to be in average physical condition, and the obsolescence to date is proportional to the age/life ratio.
Typical economic life: 40 years
Chronological age: 10 years
Typical remaining economic life expectancy: 30 years
Computation of depreciation: $10/40 = 25\%$

Effective Age/Typical Economic Life
Assumption: The improvements are considered to be in better than average physical condition, and obsolescence to date is less than proportional to the age/life ratio.
Typical economic life: 40 years
Chronological age: 10 years
Typical remaining economic life expectancy: 30 years
Estimated effective age (from inspection): 6 years
Computation of depreciation: $6/40 = 15\%$.

Superior maintenance or capital improvements which reduce effective age tend to extend economic life. In this situation a chronological expectancy of 30 years remaining becomes 34 years based upon effective age and typical economic life.

Effective Age/Typical Economic Life
Assumption: The improvements are considered to be in worse than average physical condition, or obsolescence to date is greater than usual for the age/life ratio.

Typical economic life: 40 years
Chronological age: 10 years
Typical remaining economic life expectancy: 30 years
Estimated effective age (from inspection): 14 years
Computation of depreciation: $14/40 = 35\%$.

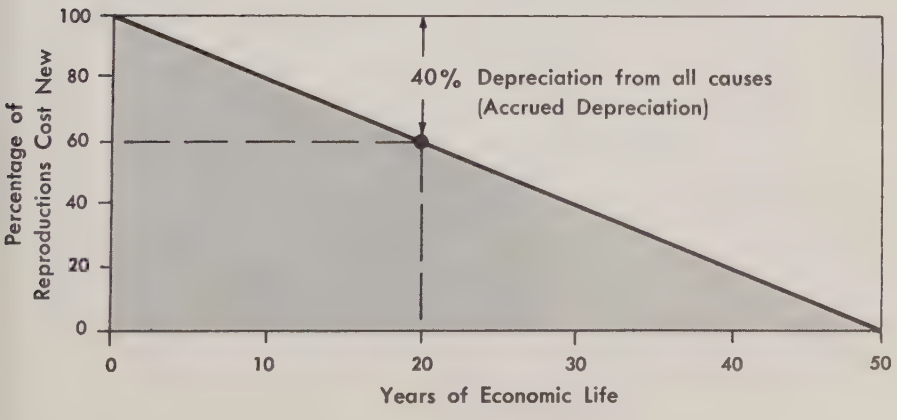
In this situation, remaining economic life expectancy may be reduced by the factors which cause effective age to exceed chronological age; therefore a 30-year expectancy becomes 26 years based upon effective age.

Actual Age/Estimated Life
Assumption: The improvements are considered to have a short remaining life, due to very poor physical condition and/or substantial obsolescence (such as a change in the highest and best use of the land).
Chronological age: 60 years
Estimated remaining economic life expectancy: 5 years
Computation of depreciation: $60/65 = 92\% \pm$

The above procedure reflects some improvement over reliance upon a simple chronological age/life relationship but, like any figure based upon a straight-line pattern, it should be subjected to further confirmation. It should also be recognized that most structures receive reasonably typical maintenance and are not remodeled or rebuilt.

Use of the straight-line technique based upon economic life may be pictorially represented by the following graph:

THEORETICAL STRAIGHT-LINE DEPRECIATION



In this graph, since total economic life is estimated at 50 years, depreciation accrued at an annual rate of 2% ($\frac{1}{50} = .02$). When the structure is 20 years old, depreciation has theoretically accrued to the extent of 40% of cost new. If *physical life* is estimated at 100 years for this specific type of property, then physical deterioration represents 1% per year or half of the 40% figure, and *obsolescence* factors comprise the remaining 20%. Here, too, the appraiser analyzes existing accrued depreciation in the property being appraised for deviation from straight-line averages, and endeavors to adjust his estimate from the straight line to the point on a curve which reflects the actual depreciation pattern for the property being appraised.

Experience indicates that that portion of depreciation due to functional and economic rather than purely physical causes, tends to occur in steps corresponding to building cycles and changing demands affecting functional utility and style. With the beginning of a new building cycle, existing apartments may become obsolescent because of the competition of the new styles. Industrial improvements may require new dimensions of bay size or clear ceiling height to accommodate contemporary requirements for warehousing, manufacturing processes, and modern machinery.

The procedure for making adjustments from an empirical straight-line assumption may vary. For example, if the appraiser has predicated depreciation analysis upon a 40-year estimate of economic life, then total depreciation has accrued at a rate of 2.5% per year. He may postulate on the basis of his judgment and experience that this is divided, for a structure of the type being appraised, 1.00% to deterioration, 0.75% to functional obsolescence, and 0.75% to economic obsolescence.

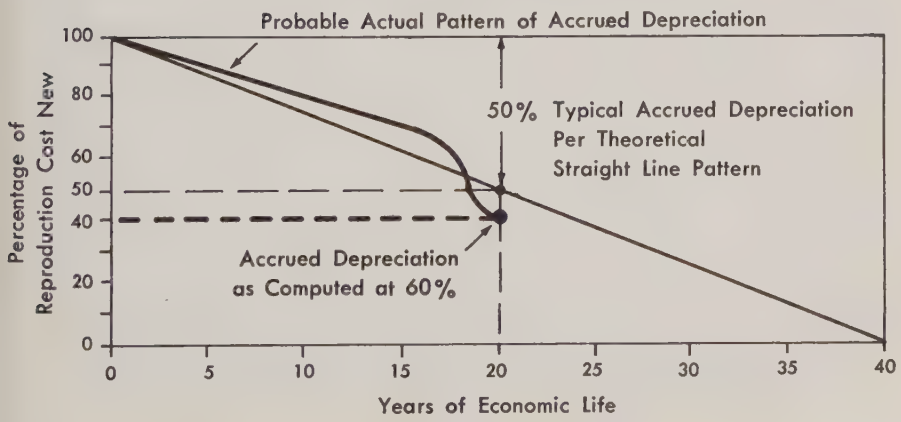
For example, assume that a 20-year-old warehouse improvement is being appraised. The appraiser inspects the property and gives consideration to the level of existing physical deterioration, as well as functional and economic deficiencies of the existing warehouse building, disclosed by his study and analysis. As a result, he may find that, in his judgment, the existing depreciation pattern of this building is as follows:

Reproduction cost		$400,000
Deterioration: No significant replacements but considerably above average maintenance.		
20 years @ 0.75% instead of 1%	15% or $ 60,000	
Functional obsolescence: Ceiling height below current standards adversely affecting rental and sales market beyond level of normal obsolescence.		
20 years @ 1.5% instead of 0.75%	30% or 120,000	
Economic obsolescense: Normal decline of area due to age. No unusual influences.		
20 years @ 0.75%	15% or 60,000	
Total accrued depreciation	60%	240,000
Presently indicated depreciated cost		$160,000

In this case the appraiser has estimated accrued depreciation at 60%, or 10% above the straight-line indication of 50% (20 years at 2.5% per year). He has adjusted from the straight line of a typical improvement of the type under appraisal to arrive at a current estimate for the specific property.

This situation may be pictorially represented as follows:

THEORETICAL STRAIGHT-LINE VERSUS ACTUAL ACCRUED DEPRECIATION



In this case a superior maintenance program reduced physical accrued depreciation in the early years, which would presumably have been reflected in improved market value during that period. At the point in years when palletizing became the accepted pattern for warehousing, the low ceiling restricted normal stacking height, adversely affecting the rental and market value of the property, causing the indicated sudden decrease in value. This pattern is not unusual for functional obsolescence which frequently occurs in steps, rather than along a theoretical straight line.

An alternate or confirming procedure to the above direct method of estimating the functional obsolescence component might involve application of a breakdown analysis technique for incurable functional obsolescence. Assume the appraiser estimates, from a rental market analysis, that the net rent loss due to the deficiency is $10,800 per year. If he is using a 9% capitalization rate,** the rental loss (due to functional obsolescence) capitalized at 9% reflects a loss in value of $120,000.

In either case, the computations leading to his conclusion may not be made part of his report, but they do represent part of his analysis. Since accrued depreciation is subjective as well as objective, it does not necessarily lend itself to mathematical analysis. Judgment and sufficient experience may enable an appraiser to recognize deviations from the norm to a satisfactory degree of accuracy without reducing his mental process to pure arithmetic.

Effective Age: In appraisal practice, as previously noted, a straight-line analysis may be adjusted from a strictly chronological basis applicable to a typical property, in order to reflect an effective age applicable to the specific property being appraised.

Chronological age may be greater or less than effective age. For example, in a 20-year-old neighborhood, a 30-year-old house designed and maintained in a manner similar to that of neighboring properties or modernized to conform, may sell for approximately the same price as adjacent homes, and therefore may have an effec-

** Rate includes interest on, and recapture of, building investment. See chapters on Interest and Capitalization Rates, and Direct and Straight Capitalization.

tive age closer to 20 years. A 40-year-old house which has been modernized so that, for practical purposes, it has the same utility and market appeal as houses built 25 years ago, may have an effective age close to 25 years.

The effective age of a given structure is defined as the age of a similar structure of equivalent usefulness, condition, and remaining life expectancy. Selection of an effective age different from actual age is an opinion based upon close observation, and a minor deviation can seldom be justified. However, for the purpose of a valuation analysis, effective age may be more significant than chronological age.

Since an economic life estimate assumes only normal maintenance, a justifiable renovation program involving additional capital investment in a structure normally extends economic life, resulting in an effective age which is more valid in terms of utility and value than is chronological age.

Breakdown Method

The breakdown concept of estimating accrued depreciation involves an analysis of loss in value considered by the three categories of depreciation. Although the complete presentation of a breakdown analysis may not be appropriate in all reports, a grasp of this procedure's underlying principles is essential to an understanding of depreciation.

The terminology used reflects an effort to apply descriptive nomenclature to the three basic categories of depreciation, which are physical deterioration, functional obsolescence, and economic or environmental obsolescence.

Physical deterioration is impairment of condition as a result of wear and tear and disintegration. It may be curable[††] or it may be incurable in that it is not economically feasible or profitable to repair or otherwise cure the condition as of the date of valuation.

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†† The word "curable," as used herein, relates to the principle of contribution (see chapter on The Basic Principles of Real Property Value) and implies that the defect can be corrected at a cost not in excess of the value of the contribution of the correction or addition to the property.

Functional obsolescence is the result of defects in design, or of changes over the years which have made some aspect of the structure, material, or design obsolete in the light of current standards. Functional obsolescence may be less obvious to the casual observer than physical deterioration, but its effect upon value is no less real. The defect may be curable or incurable, and either classification may be caused by a deficiency or an excess (overadequacy).

Economic or environmental obsolescence is the adverse effect upon value resulting from influences outside the property itself. These include, among other things, changing neighborhood, shifting retail district, and adverse economic climate. Since the source is not inherent in the property, it is not considered curable in an appraisal analysis of the property.

In order to estimate the extent of accrued depreciation attributable to each of these components of the breakdown procedure, the appraiser examines the physical property. He also analyzes existing elements of functional obsolescence within, as well as factors creating economic obsolescence from without. The problem of translating observed deficiencies into a mathematical estimate of accrued depreciation requires judgment and the application of techniques which vary with the cause of the loss in value. Appropriate techniques follow.

Physical Deterioration

This may be divided into two categories: curable and incurable.

Curable. This involves an estimate of deferred maintenance and is applicable to items subject to current repair. The measure of depreciation is the cost of restoring to new or reasonably new condition, i.e., the cost to cure; for example, the cost of exterior painting, roof repair, or tuckpointing.

Curable deterioration may also exist in some component of the structure not due for replacement or repair until some future point in time; e.g., a 9-year-old heating plant with a normal useful life of 15 years may be considered 60% depreciated. If its present replacement cost new is $1,000, physically curable depreciation deferred may be estimated at $600 today.

Incurable. This involves an estimate of deterioration which it is not practical or currently feasible to correct, and it pertains to all elements of the structure, the renewal or restoration of which was not provided for as items in the physically curable category. It applies to the present reproduction cost new of the entire structure *less* the components treated as curable.

The over-all estimate of physically incurable depreciation may be based on an age/life concept adjusted for observed condition insofar as observation is possible, and on an estimated remaining physical life. For example, a 20-year-old structure with an estimated 100-year physical life has presumably suffered 20% normal depreciation and, if observation at the end of 20 years indicates a probable additional 5% extraordinary depreciation, the total estimate becomes 25%.

Functional Obsolescence—Curable

This may be divided into two categories: loss in value caused by a deficiency or that caused by an excess.

Caused by a Deficiency. This relates to some deficiency in the structure which it is economically feasible to cure through a modernization program. Examples are: first, obsolescence due to an out-of-date store-front; and second, a lack of some item normally expected by the current market, such as air conditioning or a second bath or powder room in a residence. In the first example, the measure of accrued depreciation is the cost to cure; that is, the current cost of replacing the obsolete store-front with one meeting modern standards. In the second example, the deficiency is complete lack of a currently necessary component of the structure. Consequently, the lacking component is not included in the appraiser's estimate of reproduction cost. Only the *excess* cost of adding the item to the existing structure over the cost of incorporating the item in reproduction cost new, today, represents the measure of accrued depreciation.

In other words, it is neither proper nor logical to deduct from reproduction cost accrued depreciation on an item that has not been included in the reproduction cost estimate for the existing

building. When such modernization is actually performed, the cost up to this excess amount represents a capital improvement and an addition to reproduction cost new. To illustrate, assume that in the light of current market expectation, a residence being appraised lacks a first-floor powder room, but the existing plan will permit one to be added. The appraiser estimates that if this powder room were included in reproduction cost new today, it would represent $650 of additional cost, but to add this additional facility to the existing structure would involve a current expenditure of $800. If this expenditure is actually incurred, it adds only $650 to reproduction cost new. The additional $150 of excess cost adds nothing, and represents the economic penalty involved in correcting this item of curable functional obsolescence. It is the measure of accrued functional obsolescence due to this deficiency and constitutes the proper deduction from reproduction cost new of the existing improvement.

Caused by an Excess. An example of curable excess would be unnecessary partitioning in a retail or industrial structure. The measure of accrued depreciation in such a situation is the reproduction cost new of the excess or overadequacy, less physical deterioration already charged (in order not to deduct this portion twice), plus the cost to cure.

Assume the appraisal of a warehouse with interior partitions which represent special requirements of a former user, but which are considered undesirable by prospective users or purchasers in the market. The cost of these partitions represents $10,000 in a total $200,000 estimate of reproduction cost new. The partitions can be removed at a cost of $1,200, including necessary repairs to the structure.

Assume that the appraiser has estimated physical accrued depreciation at 20% and hence has deducted $40,000 from his $200,000 cost. Since the partitioning represented $10,000 of the $200,000, it was also depreciated 20%, or $2,000, and now represents $8,000 of the depreciated cost. Accordingly, the measure of depreciation due to this functional obsolescence is now $8,000

($10,000 less the $2,000 already deducted as accrued physical depreciation) plus the $1,200 cost of curing the situation, or $9,200.

If the cost approach is based upon a replacement cost estimate instead of a reproduction cost estimate, cost of items of excess construction or overadequacy are not included, and hence no computation or deduction to eliminate them is necessary.

Functional Obsolescence—Incurable

This also falls into two categories: loss in value caused by a deficiency, or that caused by an excess.

Caused by a Deficiency. A lack of functional utility which is not economically curable belongs in this category and may be measured by the capitalized value of the net rent loss due to the condition.

Assume that a small multi-tenancy office building has public halls that are wider than current standards or than circumstances require. This defect of design decreases the efficiency of the building by reducing the ratio of rentable area to gross area. Assume that the appraiser estimates the extent of rentable area thus lost at 1,000 square feet and that he has estimated a $6-per-square-foot-per-year rental value with a vacancy allowance and operating expenses totaling 52% of gross income. The loss of net income due to this deficiency is therefore 1,000 square feet $\times$ \$6 $\times$ 48% = \$2,880 per year. If the appraiser is using a 9% building capitalization rate, the loss in value due to this element of incurable functional obsolescence is $2,880 capitalized at 9%, or $32,000.

Alternately, the gross rent loss of $6,000 could be processed into an estimated loss in value through use of a gross rent multiplier derived from a market data analysis. For example, assuming a 5.3 gross rent multiplier, the loss in value from this cause would be $31,800 ($6,000 $\times$ 5.3). This procedure, which uses a gross rent multiplier, may be appropriate to residential appraising if there is sufficient rental data to establish a clearly discernible pattern for comparable improvements with, and without, the specific deficiency.

An error may be introduced in the above procedures if the

operating ratio were altered through elimination of the functional obsolescence. Hence, if the deficiency results in a substantial gross rental loss for an income-producing property, it may be desirable to compute the resulting net income dollar loss rather than to apply either an operating ratio or gross rental multiplier as illustrated. For a relatively small rental loss, the difference may be academic, having a negligible effect on the accuracy of the estimating process.

Caused by an Excess. This pertains to components of a structure which exceed the usual requirements, such as excessive or overadequate foundations in original construction or a formerly useful component of the original structure, now obsolete and no longer contributing to the economic whole. The measure of accrued depreciation is the reproduction cost new of the item, less physical depreciation already charged, to which must be added the present worth of the added cost of ownership, if any, due to the condition. This added cost might include taxes, insurance, or maintenance which are attributable to the excess.

An example is a building with structural members designed to support additional stories but with no foreseeable prospect of utilizing this extra strength. As already explained, using reproduction cost new, the additional cost due to this overadequate design at $10,000 may be the measure of accrued depreciation. (If 20% of this amount has already been deducted under physical deterioration, only the difference—$8,000—remains to be deducted as functional incurable depreciation.) If the physical excess results in any additional operating expense, the capitalized value of this added cost of ownership represents additional loss in value to the property. As an illustration, if the excess structure resulted in an additional tax burden of $180 per year and the capitalization rate is 9%, this added tax reduces the improvements value by $180/.09, or $2,000.

When replacement cost is used in lieu of reproduction cost, the estimated cost new for a modern building of equivalent utility

does not include the cost of the overadequate design, which eliminates this incurable functional obsolescence except for a possible penalty due to the added cost of ownership.

Economic Obsolescence

Economic obsolescence, caused by adverse environmental factors, results in some degree of market rejection, and the extent of this item of depreciation is the extent of the loss in market value. This may be measured by capitalization of the estimated net rental loss due to the condition.

Since the economic obsolescence is not inherent in the improvements, its adverse effect upon value may affect the land value, the improvement value, or both.

A residence close to a value-depreciating nuisance might still constitute the highest and best use of the land. If there is a loss in value of $1,000, this may be allocated entirely to land on the assumption that a prudent investor would recognize the potential loss due to the nearby nuisance, and would not purchase the site except at $1,000 less than a similar site in the neighborhood that is not so affected.

Conversely, a well-designed and maintained house may be located on a corner lot that has been rezoned. Since the land is now valued for its more intensive highest and best use, the improvements are subject to economic loss in value if they no longer contribute a proportionate share to property value. Similarly, an overimprovement loses value, in effect, to its environment and the extent of this loss or economic obsolescence due to location, is attributable to the improvement.

It is also possible that a neighborhood may decline in market acceptance, owing to factors such as excessive taxes, special assessments, or other governmental actions, encroachment or inharmonious land uses, changes in the character of population or in highest and best use of the land, and economic trends. Both the value of land and improvements may be adversely affected in the entire neighborhood.

A residence may be subject to economic obsolescence owing to factors which affect the neighborhood as a whole, or to a specific nearby depreciating factor such as undesirable development of a nearby site. In either case, the adverse effect upon rental value must be estimated. Ideally, this estimate should be derived from a comparison of the rental for property so affected with one not so affected. In actual practice, if a lack of residential rental comparisons makes it difficult to choose a specific figure for the estimated rent loss, the appraiser exercises judgment based upon his experience and knowledge of the rental market.

Where rental comparisons are available, application of a gross rent multiplier may be used to translate the estimated rental loss into its effect upon market value, as follows:

A figure of $10 per month (estimated rental loss) × 116‡‡ = $1,160 loss in value. As in previous example, there may be a logical basis for allocation of this loss to land or improvements, or the loss may be divided on the basis of a judgment decision. If land represents 25% of property value, and improvements 75%, then $870 (75% of $1,160) may be ascribed to the improvements. Presumably the adverse effect of the depreciating factor upon land value (25% of $1,160, or $290) was accounted for in the valuation of the site by comparison with other sites similarly affected. Otherwise, the indicated effect upon the value of this site represents a deduction from the land value estimate.

In an analysis of income-producing property the same procedure involving use of a multiplier is appropriate. Alternately, the loss in rental value may be reduced to a net rental loss and capitalized into a loss in market value.

Economic Factors Offsetting Depreciation

Depreciation of a wasting asset constitutes a fact, although market experience may not always appear to reflect this. A property which has a current value of $100,000 may consist of 20% land

‡‡ Assumed gross rent multiplier.

value plus 80% building value with an estimated 40-year remaining economic life. On the assumption of a straight-line depreciation rate at 2.5% per year for the building, the total property value may anticipate an average decline at a rate of 2% per year or 20% over a 10-year period. This is loss in terms of the ability to command other commodities in exchange.

If, during this 10-year period, the dollar as a unit of measurement has also declined in value, due to inflationary pressures in the economy, at a rate perhaps exceeding 2% per year, resale at the end of the period in terms of cheaper dollars may create the illusion that no loss of value has occurred or even that the property value has appreciated. However, this is true only in terms of different units of measurement and does not affect the validity of a declining real value concept or accrued depreciation in terms of value in exchange.

There has been recognition that prospective purchasers may look at value over an extended period of time in terms of numbers of dollars, regardless of their changing value in exchange. This has created a new dimension in appraisal methodology, the proper application of which is not inconsistent with the validity of an empirical declining value concept.

Summary

Accrued depreciation in the cost approach is the difference between the value of a building (or other improvement) at a certain date and its cost of reproduction as of the same date. Depreciation is caused by physical deterioration, functional obsolescence, and economic obsolescence.

Indirect and direct methods of measuring depreciation, including economic factors, may be outlined as follows:

I. Indirect methods
   A. Capitalized income
   B. Market data
II. Direct methods
   A. Straight line

1. Physical life basis (limited to physical component of depreciation)
   a. Straight line, based upon an over-all remaining physical life estimate
   b. Engineering, based upon individual estimates for components of the structure
2. Economic life basis
   a. Straight line, based upon an over-all remaining economic life

B. Breakdown method
   1. Physical deterioration
      a. Curable
      b. Incurable
   2. Functional obsolescence
      a. Curable, due to
         (i) Deficiency
         (ii) Excess
      b. Incurable, due to
         (i) Deficiency
         (ii) Excess
   3. Economic obsolescence

When accrued depreciation in the cost approach is measured indirectly by the market data or income methods, the derived value estimates are related to reproduction cost new. These methods result in a valid single-figure estimate of depreciation from all causes.

Direct methods of estimating accrued depreciation, used in the cost approach, maintain the relative independence of the three approaches to value, and are generally applicable to the appraisal of single-use improvements. A straight-line or age/life pattern may be applied on a physical or economic life basis. In the latter, the effect of all types of accrued depreciation is reflected in accordance with average experience studies. When applied on a physical life basis, the effect of functional and economic obsolescence must be considered separately.

In report presentation, a straight-line pattern based upon an economic life estimate is extensively used to rationalize the appraiser's estimate of accrued depreciation. This presentation has merit in that it is easily explained and widely understood. How-

ever, if a breakdown analysis for the property being appraised reveals deviations from average experience for any component of depreciation, the average effect being inherent in the straight line, then a judgment adjustment from that line is in order.

In the breakdown method the extent of accrued depreciation owing to each individual component of depreciation is separately analyzed and its effect estimated.

The fact that accrued depreciation may be offset in part or in whole, due to inflationary pressures, is not necessarily inconsistent with the validity of an empirical declining value concept.

The theory of accrued depreciation and methods of estimating, as reviewed in detail herein, need not always be presented in similar detail in reports for clients who may not be interested in documentation or in the step-by-step processes of reasoning followed by the appraiser.

There are, as outlined, various procedures leading to a correct estimate of accrued depreciation "from all causes." The selection of an applicable procedure in any instance requires an understanding of the nature, causes, and components of depreciation.

CHAPTER FOURTEEN

The Cost Approach

THE COST APPROACH is one of the three approaches in the appraisal process, i.e., cost, market, and income. The cost approach was introduced in the chapter on The Appraisal Process, and summarized in five basic steps, briefly indicating the procedure and its problems. Essentially, it provides for an estimate of land value, to which is added the depreciated reproduction or replacement cost (new)* estimate of the improvements. For the procedure of the cost approach which is developed in this chapter, the basic steps follow:

1. Estimate land value as if vacant.
2. Estimate reproduction cost new or replacement cost new of the basic improvements and minor structures (excluding any that were included as part of the land value).
3. Estimate in dollar amounts the accrued depreciation caused by
   a. Physical deterioration,
   b. Functional deficiencies,
   c. Adverse economic influences.
4. Deduct accrued depreciation from the improvements' reproduction cost new to arrive at a present depreciated cost estimate.
5. Add the land value (from Step 1) to the depreciated cost estimate (from Step 4) to arrive at a value indicated by the cost approach.

Underlying Principles

The principle of substitution† is basic to the cost approach, in that no rational person will pay more for a property than the

* For definitions, see first page of chapter on Building Cost Estimates. The dollar difference between reproduction cost and replacement cost usually indicates lack of functional utility.

† See chapter on the Basic Principles of Real Property Value.

amount for which he can obtain, by purchase of a site and construction of a building, without undue delay, a property of equal desirability and utility. Consequently, reproduction cost new, *prior to any deduction for accrued depreciation,* plus land value, tends to set the upper limit of value.

Reproduction cost is related to an objective value concept. However, cost to create is not necessarily value, as demonstrated by the classic example of an office building erected at great cost in a remote location where income would be insufficient to offset even the basic essentials of operating expense, much less to produce a net income stream.

In order, then, for the cost approach to produce a meaningful reflection of a market value in relation to the value estimates obtained through use of the other two approaches, it is necessary to analyze accrued depreciation, including functional and economic lack of utility, and obsolescence. This has been explained in the preceding chapter. With the introduction of these considerations, the cost approach moves beyond a basically objective to a subjective concept, and physical cost is modified by the effect of these factors on the minds of purchasers in the market place. This means that if reproduction cost new plus land value represent the upper limit of value, and if depreciation from all causes is properly estimated, the resultant value indication should reflect market value, and lend itself to reconciliation with other value indications.

A significant use of the cost approach is in the valuation of public buildings or certain types of special-use properties for which rental or sales market data is limited. The principal difficulties in the approach arise in estimating viable construction cost figures, also accrued physical, functional, and economic depreciation, particularly in older properties.

Estimating Land Value

The characteristics of sites and the principles of site valuation have been discussed fully in previous chapters. However, it

should be re-emphasized that land value is not the historic cost of the land or the acquisition price plus the expense of making it usable through addition of underground or other improvements. The land value component of the cost approach does not reflect an original cost-to-create or cost-to-acquire concept, but is estimated whenever possible on the basis of current selling prices of comparable sites and other pertinent market data. It is this estimated value of the land that is added to the cost of the improvements in this approach. When sufficient comparative data is not available, or if the market data indication is inconclusive, then land value may be estimated by other methods.‡

Direct Building Costs

The principles of building cost estimating, the various elements involved in the cost of improvements, and the possible confusion as to what is or is not included in the unit costs available from different sources were discussed in the chapter on Building Cost Estimates. As pointed out in that chapter, many tabulations are published which show the comparative costs of different types of buildings, but not all of these sources specify the basis underlying the data which they set forth. Accordingly, before using published or locally obtained cubic-foot or square-foot cost data on certain types of property, the appraiser ascertains just what components are included in the unit costs.

Preliminary construction costs, special conditions,§ contractor's overhead and profit, professional fees, carrying charges during construction, and other indirect costs may vary, owing to many factors including job and location. Therefore it is good practice to apply unit reproduction-cost figures that exclude estimated indirect costs. These may then be considered separately.

Landscaping, parking facilities, walks, drives, or other yard improvements apart from the basic structure should also be esti-

‡ Chapter on Site Valuation.

§ Extra costs owing to traffic congestion; protection of adjacent streets, traffic, or properties; etc.

mated separately, unless they are so minor in amount that they may be included with either the land estimate or the building estimate. More often, these elements involve substantial expenditures which, if included with the structure cost, would distort unit costs and reduce their usefulness for comparison purposes.

Indirect Building Costs

Indirect costs frequently are figured as a lump sum percentage which is added to the direct costs of material, labor, and subcontracts. However, some indirect costs are not related to the size and direct cost of the improvements. Items which comprise indirect cost may include:

1. Expenses for title examinations, recording fees, legal fees, etc.
2. Expense preliminary to a construction program, such as consultations, surveys, soil borings, building permits (unless the last are included in the general contract for construction)
3. Professional services of architects, engineers, and others
4. Taxes paid during construction
5. Casualty insurance during construction
6. Administrative expense of the owner or his agent during construction
7. Cost of interim or long-term financing and interest during construction.

Contractor's overhead and profit, unless the developer is also the contractor, are generally treated as direct cost, since the building contractor usually includes them in his construction contract.

The estimate of indirect costs cannot always be made with the same precision as direct costs because there may be no exact basis for some of them. In the actual construction of two similar properties, indirect costs may differ materially although the direct costs are practically identical. This is to be expected because, as previously noted, not all indirect costs are directly attributable to the physical property. They may be affected by conditions of delay, judgment, and circumstances which are rarely identical in the development of two similar properties.

The process of making an indirect cost estimate may be shown

by the following: Assume that an apartment building involving a direct cost of $300,000 is to be built on a site valued at $80,000. The tax rate is 5%, and assessments are on a 40% basis, resulting in an effective tax of 2% per annum. Insurance rates for construction are $0.75 per $100. Cost of adequate supervision for the owner is $200 per month.

Under these conditions, the indirect cost estimate may thus be projected:

Taxes during construction (construction period estimated at 10 months plus 4 months for plans and contracts)		
Land: 14 months at 2% a yr. × $80,000	$1,865★	
Building: 10 months at 2% a yr. on 50% of $300,000	2,500♦	
Total taxes		$ 4,365★
Insurance		
Building: Average of $150,000 investment for 10 months at .75% per annum		940★
Supervision		
Building: 10 months at $200		2,000
Legal fees, etc.		
Land and building: Examination of title and contracts; services during construction		695
Financing: Construction loan interest plus permanent loan fees based upon current mortgage market requirements		11,000
Architectural and engineering fees: 5% of $300,000 contract cost of construction		15,000
Total indirect costs		$34,000

The indirect costs in this case amount to about 11.3% of the total of $300,000 for direct building cost. This estimate will be affected by such factors as construction time, availability and terms

★ Figures are rounded.

♦ Assessment policies on partial completion of construction vary in different jurisdictions.

of financing, and extent of architectural and legal services. For example, if a zoning change is involved, legal fees may be increased; then, however, the land may be simultaneously enhanced in value. Factors which would materially affect the above indirect-cost percentage are changes in the money market and in the extent of professional design or supervision service.

This list of indirect costs omits additional charges. The equity portion of the money presumably was segregated and is entitled to earn a return. Assuming that the rent schedule is to be $4,000 per month, a lag in occupancy might represent a 50% vacancy loss for six months, or $12,000. Such indirect costs are not actually paid out, but are reflected in reduced income to the owner or developer. Other contingencies may contribute to the total. Sales commissions are not normally considered part of indirect cost.

Items included in contractor's overhead on commercial construction are field supervision, allocation of main office expense, tools and minor equipment, rental of other equipment, employers' liability insurance, field office, photos, public liability insurance, and permits. All of these expenses are normally included in the general contractor's bid figure, either under one heading or allocated and included under other headings. Direct building costs for material, labor, and subcontracts are only part of the over-all costs. In appraisal of a structure to be built from plans and specifications, the appraiser may include in the appraisal report under "qualifying and limiting conditions" a statement to this general effect:

> The estimated value is subject to completion in accordance with plans and specifications, assuming proper workmanship, and further assuming that the building is occupied and in operation.

Another factor which sometimes enters into the cost approach to an indication of value is entrepreneurial or developer's profit. This profit potential offers the incentive for much new construction, which may be for speculation rather than for the owner's

direct use. The extent of this incentive is variable with economic conditions and personal circumstances, and hence is not easily estimated on a typical basis for inclusion in the cost approach.

For new properties which are well designed and represent the highest and best use of the site, a measure of developer's profit may be derived from a comparison of the value indicated by the cost approach with the value indications derived from the market data and income approaches.* In the preceding example, a cost approach value indication might be summarized as follows:

Improvements		
Direct cost	$300,000	
Indirect cost	34,000	$334,000
Land value		80,000
Total		$414,000

Assume now that the market data and income approaches indicate a probable market value after completion of $460,000; then the difference, which amounts to $46,000, represents developer's profit. He may, if he is a substantial operator with some purchasing advantages, augment this profit margin to the extent that he can erect the improvements at less-than-typical unit costs. If he is also the contractor, his margin is increased by the extent of contractor's overhead and profit.

Building Inspection

The logical point to begin the inspection of a building is to establish its general type and to note specific items to be inspected. These and any preliminary facts concerning the particular building are tabulated, as has been discussed in detail in the chapter on Building Material and Equipment. From these items and facts, the appraiser constructs a skeleton arrangement or grouping of related parts for inspection.

* See chapter on the Appraisal Process.

The checklist for a building inspection may be more or less detailed, depending on the type of property. It may provide enough space on the list to make all estimates and supporting comments on observed condition, or record only the observed condition at the site, leaving all or most of the estimating to be done as a desk operation. It also may be used as an outline and reminder sheet which may include, among other items, the following:

1. Description of the structural and mechanical components of the improvements in outline form
2. A list of building items and equipment (such as air conditioning) installed in the building but owned by a third party who collects rental for its use
3. Data on recent major repairs or capital expenditures
4. An estimate of general deterioration, expressed either as a percentage of reproduction cost or as a dollar amount
5. A similar estimate in dollars for rehabilitation
6. Estimated remaining useful life for items periodically replaceable during the life of the main structure
7. Description of functionally obsolete items and the estimated cost to cure, if curable
8. Pertinent comments on physical appearance and condition as observed.

As explained in the chapter on Building Cost Estimates, the difference between reproduction cost and replacement cost (the latter being the cost of producing a building of equal utility with currently available materials) may automatically reflect some of the functional obsolescence in the building. Care must be taken not to include a deduction for such functional lack of utility when replacement cost is used in preference to reproduction cost.

Developing the Estimate

After the estimates of the respective cost elements are made, the indicated value by the cost approach is found by deducting accrued depreciation. This depreciated cost of the improvements

is added to the value of the land. The computation is set forth below.

Reproduction cost new			
Direct cost	$300,000		
Indirect cost	37,000		
Total cost		$337,000	
Accrued depreciation			
Rehabilitation (physical curable)	$ 2,600		
General deterioration (physical incurable)	45,900		
Curable functional obsolescence	none		
Incurable functional obsolescence	27,100		
Economic obsolescence	none		
Total accrued depreciation*		$ 75,600	
Reproduction cost depreciated		$261,400	
Other improvements△		$ 23,600	
Total depreciated cost of improvements			$285,000
Land value			$ 80,000
Value indicated by cost approach			$365,000

Later, comparison with the value indications found by the market data and income approaches should confirm the estimate of depreciation.

* In preparing his valuation report, the appraiser may elect, instead of breaking down accrued depreciation into the various categories, to show his estimate of accrued depreciation from all causes as a single total figure, and to reserve the details of his analysis in his working papers. The type of presentation made by the appraiser concerning accrued depreciation depends upon the circumstances, the requirements and purpose of the report, and other considerations.

It is difficult in the cost approach to make a direct estimate of the exact amount of loss due to physical deterioration in hidden parts of the structure. It is equally difficult to estimate incurable functional obsolescence and loss in value due to adverse economic influences, without recourse to support by the market data and income approaches.

△ Alternately, other improvements may be listed on the basis of reproduction cost new following the building cost above, and appropriate accrued depreciation charged under the depreciation headings.

Cost Basis, Public Utility Valuations

In public utility valuations, two value bases are used for rate-making purposes, i.e., fair value, which is defined as replacement cost less actual existing depreciation, or historical original cost less book depreciation that has been accrued for accounting purposes. The choice of which one to use depends upon the rules of the state regulatory commissions in the various states. However, in the case of the federal regulatory commissions, the latter has been used.▲

Major Considerations

All estimating requires a sense of balance and proportion, attention to detail, and exercise of a degree of judgment which is gained from experience. Although completed appraisal reports may vary in the extent of the inclusion of all of the various steps and details inherent in the appraiser's application of a comprehensive cost approach analysis, they usually set forth the essential basis for estimates of cost and accrued depreciation.

Summary

The cost approach is one of the three approaches in the appraisal process. Underlying the theory of the cost approach is the principle of substitution, which suggests that no rational person will pay more for a property than the amount with which he can obtain, by purchase of a site and construction of a building without undue delay, a property of equal desirability and utility. Consequently reproduction cost new, prior to any deduction for accrued depreciation, plus land value, tend to set the upper limit of value. In order for the cost approach to produce a valid indication of the market value which may be reconciled with the value indications obtained by the other two approaches, it is necessary to give effect to accrued depreciation due to all causes—functional and economic, as well as physical.

▲ For further information, see Walter R. Kuehnle, M.A.I., "Public Utility Valuation," *The Appraisal Journal,* April 1972, p. 195.

The five basic steps of the cost approach are:

1. Estimate the land value as if vacant.
2. Estimate the reproduction (or replacement) cost new of all the improvements.
3. Estimate in dollar amounts the accrued depreciation caused by physical, functional, and economic factors.
4. Deduct the accrued depreciation to arrive at the present depreciated reproduction (or replacement) cost new of the improvements.
5. Add the land value to the depreciated reproduction (or replacement) cost new of all improvements, to obtain the value indication by the cost approach.

CHAPTER FIFTEEN

Market Data Approach—Principles

THE MARKET DATA APPROACH to an estimate of value is a process of comparing market data; that is, prices paid for similar properties, prices asked by owners, and offers made by prospective purchasers or tenants willing to buy or lease. This approach is also called the direct sales comparison approach.

Market data, when carefully verified and analyzed, is good evidence of value because it represents the actions and reactions of sellers, users and investors. The market value estimate has been defined as an interpretation of the reactions of typical users and investors in the market. As in the cost approach, the market data approach is also based on the principle of substitution, which in this approach implies that a prudent person will not pay more to buy or rent a property than it will cost to buy or rent a comparable substitute property. The price a typical purchaser pays is usually the result of an extensive shopping process in which he is constantly comparing available alternates. When he does buy, he chooses the property that represents to him the best balance between his specifications and the purchase price. The seller usually asks more than he expects to realize because he may find a non-typical purchaser willing to pay more than market value. After he has tested the market for a reasonable time without

success, the seller may reduce his price or accept an offer which is less than his asking price. Thus, although individual sales may deviate from a market norm, a sufficient number tend to reflect the pattern of purchasers and sellers in the market. When information is available as to a sufficient number of comparable property sales made in the current market, the resulting pattern is a good indication of market value.

Steps in the Market Data Approach

In applying the market data approach the appraiser takes five steps:

1. Seeks out similar properties for which pertinent sales, listings, offerings, and/or rental data are available.
2. Qualifies the prices as to terms, motivating forces, and bona fide nature.
3. Compares each of the comparable properties' important attributes with the corresponding ones of the property being appraised, under the general division of time, location, and physical characteristics.
4. Considers all dissimilarities in terms of their probable effect upon the sale price.
5. Formulates an opinion of the relative value of the property being appraised as compared with the price of each similar property.

The sole purpose of gathering market data is to answer this final question: Does the conclusion obtained from analysis of sales, with any necessary adjustment, indicate today's probable market value of the property being appraised?

Data Program

The sources and methods by which pertinent data is collected in the valuation process have been presented in previous chapters. Customarily, the major areas of comparison between one property and another require data concerning time, location, and physical characteristics.

Since systematic and orderly procedure for the process of comparison is important, it is in order to consider the scope and organization of the data program before considering the categories of comparative data.

Scope of Pertinent Data

The following outline is a guide to the character and scope of the data processed in this approach.

A. Sales, offers, and listings of other properties
   1. Description of properties
      a. Physical information: terrain, construction, architecture, size, plan, number of rooms, condition, etc.
      b. Desirability of location
      c. Income data, leases, etc.
   2. Price paid, offered, or asked, and the terms
   3. Other conditions
      a. Date of sale
      b. Relative position, competence, and bargaining ability of each party
      c. General economic conditions prevailing
      d. Any special need for purchase or special desire for disposal
      e. Any unusual financing

B. Supply and demand considerations
   1. Number of similar properties available for purchase, and rate of turnover
   2. Number of similar properties or rental units vacant, and the trend of demand
   3. Number of similar properties or rental units under construction or in prospect

C. Informed opinions regarding purchase and rental of comparable properties
   1. Asking price and price obtainable.
   2. Market conditions.

Sources of Information

The appraiser learns where such information may be found and how it should be maintained for maximum usefulness. As

previously developed, there are numerous sources of data: the appraiser's own files, public records, atlases and survey maps, lease records, published news, classified ads and listings, other Realtors, lenders and appraisers, direct interviews, published listings, reported sales, or other local sources available.

Office Files. Appraisers who are also brokers may maintain office files relating to certain transactions. In addition, the facts obtained during the preparation of one appraisal may be of considerable help on another. Data which the appraiser accumulates is called his appraisal plant, or data bank.

Public Records. Many counties have maps publicly or privately published, which show the ownership of land. From these maps, information on recorded ownership may be obtained. Statutes in some states require that revenue stamps be affixed to deeds. The amount represented by these stamps is one possible indication of the price paid. In some localities there are legal or private publishing services which issue information on revenue stamps and other pertinent facts about current transfers.

Atlases and Survey Maps. These give data on lot size, relate legal descriptions to street numbers, and frequently show building locations and dimensions to scale.

Lease Records. There may be a county index of leases listing the parties to recorded leases, and referring to the volume and page in which the lease is recorded. In some cities abstracts of recorded leases are printed by a private publishing service.

Published News. Real estate news is featured in the newspapers of cities of any size. Sometimes the news is inaccurate, but the names of the negotiating brokers and the parties involved generally are published, which makes it possible to confirm details.

Classified Ads and Listings. The appraiser may have his name on the mailing list of banks, brokers, and others offering properties for sale. Classified ads are also a source of information on properties currently being offered for sale.

Realtors, Appraisers, and Bankers. Such professionals are, as a

rule, a prime source of information. Though unsupported hearsay may not be dependable, it may provide valuable leads to vital facts.

Direct Interview. Confirmation of statements of facts by one or both of the principals in a transaction is the ideal. Alternatively, confirmation may be sought through the brokers concerned in the transactions; or sometimes the owners and tenants of neighboring properties are a possible source of leads to factual information.

In some communities local sources publish in book form multiple listings which have been sold during a calendar year. Such publications give complete information including a picture, a complete description of the property, the broker's name, and the authentic sale price. In some areas such multiple listing books are offered for sale.*

The Appraisal Plant

Through a sound data program, a large bank of market data can be accumulated. Only some of it is immediately pertinent. The problem is to organize the data in a way to serve the appraiser's needs most effectively. This data may be accumulated as needed, or in the case of a research organization, a large staff may collect, index, and cross-index market data for use at some future time. Some appraisers may adopt a middle course; that is, accumulate the data themselves, which they then index and file to suit their needs. Such records may carry the address, a file number, and additional salient information. Ordinarily, sufficient information is included to indicate whether the property is related to the working assignment and whether the detailed file on the property should be studied.

A workable classification of sale and rental data follows:

* In the Chicago area some of the outlying real estate boards publish Multiple Listing Books.

PROPERTY DATA CARD

No. and street ..... Index No. .....
From .....
To .....
Date .....
Price or rent .....
Land description .....
Zoning at time of sale .....
Building description ..... Age .....
Comments and comparison .....

A data record system may be classified by property categories, such as the following:

Residential
- Acreage
- Vacant lots
- Residences
- Apartments

Commercial
- Acreage
- Vacant sites
- Retail stores
- Office buildings
- Hotels and motels
- Service buildings

Industrial
- Acreage
- Vacant sites
- Factories and plants
- Warehouses
- Loft buildings

Special Purpose
- Gasoline service stations
- Hospitals and nursing homes
- Theatres

Miscellaneous
- Large housing projects
- Institutional structures

Cross indexing from the alphabetical address and area entries to class-of-property entry—the latter being kept in a separate file —has the advantage of making readily available the market data on location and type of property. Such a system is functional, well suited to the continuous weeding-out process necessary to keep the material current.

In addition to files recording address and property, detailed information may be entered on a master sheet for each com-

parative property. More data may be included than that shown on the form below:

MARKET DATA APPROACH—RESIDENTIAL PROPERTY

City: Any town, Illinois
Address: 20231 Wilmore Avenue Property: Dwelling
Court House Identification: Book 642, pg. 22, item 22
Grantor: Joseph E. Smith
Grantee: E. W. and E. M. Reeve Date: 3/20/73
Recording: Volume 9095–706
Consideration: $10 Illinois Rev. Stamps: $30.00
Indicated Price: $30,000
Land: 40 × 120, 4,800 sq. ft.
Improvements:
Typical 5-room frame, 1½ story and basement, 1-car garage, full concrete drive, combination storm sash. Good condition. About 25 years old. 30 × 24 ft. on foundation.
Comment:
Confirmed price as $30,000, per E. W. Reeve, 6/15/73. No special circumstances. Has not considered it necessary to redecorate since purchase. Has installed new water heater.

This market-data master sheet may be supplemented by an attached photograph or, for larger properties, the copy of the printed brochure that was prepared in offering the property for sale. Periodically, as needed for a report, the master data sheet may be duplicated and included in the addenda. In the body of the appraisal report, the actual comparison with the property under appraisal may be summarized thus:

> 20231 Wilmore Ave. See Addenda, Exhibit C-2 for detail. This property, which sold in 1973 for $30,000, is equal to the property being appraised as to location, slightly better maintained, equal in size, and has a detached one-car garage; whereas subject has only driveway and slab. The property being appraised is rated as $700 inferior.

Such information may be stored in a simple, indexed filing system or may be part of an elaborate computer storage system that is

used for instant recall by categories such as type of property, location, age, or price range. The choice of a system to use depends largely on which most effectively meets the appraiser's requirements according to its cost, convenience, and the types of property which he usually appraises.

Elements of Comparison

A comprehensive market data file makes available a variety of market facts which may be marshaled into a systematic analysis.

The appraiser's objective is to interpret from data on comparable sales the probable price which the property under appraisal would bring in the market. Since no two properties are exactly alike, the potentially comparable sale (or rental) properties and a property being appraised are reconciled.

In making comparisons between a comparable sale and a property being appraised, the appraiser must recognize similarities and dissimilarities. The conclusions which are most dependable are those based upon comparisons of factors and conditions which are similar. The dissimilarities which affect the relative desirability and utility of the properties being considered, and the resultant comparisons assist in arriving at a logical estimate of value. The appraiser considers the amount which such dissimilarities add to, or subtract from, the sale price, in order to obtain an adjusted figure reflecting the probable value of the property being appraised.

Among appropriate elements of comparison are the following:

Period and Time of Sale

The length of time for which specific sale comparisons may be useful varies with the character of the market, the rate and extent of market change, and the type of property. For example, sales of farm land in a slowly changing market with a limited number of transactions annually may contrast sharply with the activity of the market for modern warehouse properties in an expanding industrial area. For the farm lands, the appraiser may be justified in

extending the time-range of sale comparison data beyond that appropriate for the warehouse properties.

In making adjustments for time, it is necessary to note the effect of general economic conditions and price levels. To use sales data from a previous period of time as an indication of an anticipated sale price for the property, figures at which the comparable properties were sold need adjustment in order to reflect the current price level. If this level were approximately 10% higher than three years ago, then an upward adjustment would be applied to a three-year-old property sale.

Neighborhood and Location

Similar properties might sell for more in one neighborhood than in another. If the sale were in a neighborhood where comparable houses consistently bring 5% less than those in the neighborhood being considered, that amount may be added to the sale price of the comparative property, bringing it into line with the probable current market for the property under appraisal.

Physical Characteristics

These are of two kinds, and are treated in the same manner as the characteristics of neighborhood and location.

Site and Land Improvements. Similar properties may differ regarding site qualities; that is, in frontage, size, land improvement (landscaping), or terrain. For example, the subject property might have a 50-foot lot whereas a comparable property has a 60-foot lot. An adjustment can be made for the difference in the value of the two lots as presently improved.

The difference in plantings, lawn, drives, fences, parking areas, barbecues, or perhaps even swimming pools, may be handled on a direct dollar-adjustment basis, since the appraiser deals with net values as distinguished from cost. Common denominators in the form of units may be used for effective comparison.

Building Improvements. For residential property, the ultimate unit of comparison is the dwelling itself or the apartment house;

but the unit could be (a) an entire dwelling; (b) a room, with a standard room count; or (c) a square foot, using dimensions of living area or of foundation.

For multi-unit apartment houses, the unit of comparison may be the apartment, the room, or dollars per square foot of rentable area. If the last measure is used, the number of square feet of living area is logically a better measure than gross area. However, the number of square feet of gross area can be more accurately established and is more frequently used in the cost approach. The apartment as a unit is a very rough measure of comparison unless there is considerable uniformity in the number, size, and character of rooms per apartment. Generally, the room or a square foot of apartment area is the unit most widely used. Here also it should be recognized that the market price per room for two- or three-room units may be greater than that for five or six rooms, other things being equal. In industrial properties the unit of comparison is usually the square foot of gross usable floor space, and in office buildings, a square foot of rentable area. Parking, service, and public areas usually should be considered in relation to their effect on sale prices. Observed quality of construction, age, and other major variations in the building, as well as functional inutilities also are taken into account.

At the time of sale, the purchaser is acutely aware of the condition of the property. By the time the appraiser considers a property as a comparative sale, the buyer may have rehabilitated or modernized it. A personal interview may be necessary to ascertain the extent of such work, in order that the sale may be adjusted to a truly comparable basis.

Gross Rent Multipliers

The comparison process also concerns economic comparability. Income properties are sometimes compared on a gross multiple basis. For example, in appraising a standard apartment building, analysis of comparable sales may show that such sales have been made at a fairly uniform multiple of the gross income. This could

be carried through and applied to net income. But at that point the process is more properly considered as part of the income approach, whereas comparisons of gross income may sometimes be used as a part of the market data approach.

A gross income or gross rent multiplier (GRM) is a factor reflecting the relationship between the gross annual income of real estate and its sale price or value. For a residence, it is often computed on the basis of monthly income, but for all other types of property it is on the basis of annual gross income; for example, properties selling for $100,000, with an annual gross of $20,000, are selling at five times the gross, indicating that a GRM of five may be applied to the gross annual income of a closely comparable property to convert that gross to a value estimate.

Since the GRM relates value to gross income rather than net income, its use is valid only for types of properties which are:

1. Reasonably consistent in net-to-gross-income operating ratio, and
2. Sell with sufficient frequency in the market to produce a discernible GRM pattern.

This is frequently applicable to specific classes of apartment properties, retail properties, industrial properties, and others where there exists a reasonable similarity of age, size, location, land-to-building ratio, and operating experience.

A multiplier may be applied either to gross income or to effective gross income, if the method of application is consistent with the supporting data. The circumstances and available data indicate the appropriate procedure in a specific situation.

The GRM is closely related to market action and it is easy to explain. However, the principal advantage of the technique is that the reflection of rental income is direct. Therefore differences between properties, which could involve adjustments based upon judgment estimates, have been resolved by the free action of the rental market. If Property A has some advantage over Property B in age, condition, accessibility, location, or physical characteristics, the difference in actual rental presumably reflects the extent of

this advantage as viewed in the market. Since some adjustments for relative desirability are thus inherent in the factor, a GRM may not be subject to adjustment after having been computed. An exception might be where tenant credit is a factor affecting the rental level or relative market desirability.

In the appraisal of single-family residential property, where application of a typical income capitalization approach is not practical, the use of a GRM is accepted in some areas as an income approach to a value estimate, and is usually expressed in terms of a factor, such as 100, 112, or 130 times the estimated monthly rental.

Analysis of Market Data

The sale prices of a number of comparable properties (adjusted to the property being appraised) are most convincing as evidence of the appraiser's market value estimate.

Considerations in Analysis

1. Number of sales
2. Period of time covered
3. Terms on which properties were sold
4. Rate of turnover
5. Motivating force (purpose of seller or buyer)
6. Degree of comparability.

Number of Sales. The number of comparative sales to be accumulated and analyzed depends somewhat on their comparability and the nature of the market. If there is a block of similar homes and several of them were sold in recent months, it seems unnecessary to look further. If, however, comparable sales must be sought in a wider area and over a longer time span, it may be necessary to find and analyze a greater number to indicate the market value by reflecting the actions of typical purchasers in the market. One of the guidelines is for the appraiser to get a sufficient number of sales to provide adequate support for a conclusion of value.

Period of Time Covered. In a less active market it may become necessary to check back for several years to find sales data. In a

dynamic market the number of recent sales may be adequate. If it is desirable to establish a market trend for a particular type of property, sales data may be obtained covering a reasonable period prior to the time of investigation. Such data may produce indicated percentages of increases or decreases for time which may be used to adjust prior year sales of comparable properties to an indication of a current market price. Such adjusted prior-year sale prices may then be used as present-date comparables in the market approach.

Terms. In an "arm's length" transaction (unless there are some special considerations), the seller receives cash. The purchaser may not have all of the cash, but he may be able to borrow enough from a lending institution with the consequence that the seller receives cash for his property.

When real estate is sold on terms, the selling price is frequently higher than it would have been on a cash basis. For example, where a property is sold on contract with a small down payment, the sale price is usually higher than a cash price. Under these circumstances, if the seller wanted to realize cash, he might be obliged to discount the purchase contract materially. Frequently there are transactions that involve a purchase-money mortgage given to the sellers. If this was necessary because no other lenders were interested, the terms of financing by the seller are probably reflected in a higher sale price.

In making market value appraisals, it is important to learn, so far as possible, the details of the sales transactions used as comparable data. Transactions which involve special financing by the seller must be described accordingly, and either rejected or the considerations adjusted to reflect market value as defined in this text.

Rate of Turnover. When a large number of property sales occur in a neighborhood which has been relatively dormant for many years, the appraiser should try to ascertain the reason. There may have been a change in zoning which makes the property available for a higher use; or there may have been a change in the character

of the neighborhood. If comparisons are made with properties in other neighborhoods in either of the above-mentioned conditions, adjustments are in order.

The law of supply and demand exerts strong influence on the real estate market. Sales activity tends to fluctuate with economic conditions and oversupply or shortages of particular types of properties and space.

Motivating Force. Sometimes it seems that the concept of a sale made by "a willing buyer" and "a willing seller . . . neither being under abnormal pressure," is actually realized too infrequently. One person wants to buy and another wants to sell, and in the nature of things the motivation of one party is likely to be stronger than that of the other. (See the section on Buyer-Seller Subjective Value Concepts in the chapter on the Nature of Real Property and Value.) A wide variety of motivating forces can occur in real estate transactions which can affect market price in relation to market value. The most common of these are:

1. Desire to liquidate for inheritance tax or other pressing reasons
2. Desire and need to own a particular property for expansion, parking, or other purposes
3. Immediate possession, or lack of it
4. Low or high rentals under an existing lease
5. Sales between related or affiliated parties
6. Sentimental interest of purchaser, or any factor which results in a negotiating advantage for either buyer or seller.

Many situations could be cited to illustrate each of these motivating forces. For example, a man dies, and when his estate is probated, it becomes apparent that more cash is needed to pay the inheritance tax. This may necessitate selling one or more of the real estate holdings. Perhaps all the property must be sold because some of the heirs want immediate cash. Generally under these conditions, real estate appraisals of liquidation value tend to fall in the lower part of the range. If the holdings are comprised of single-use properties, usually hard to sell, the need to meet the time schedule may work against finding a buyer willing to pay the highest price.

Assume a case history, a 3-story walk-up apartment property with 36 units, which illustrates why a buyer may pay more than market value for a parcel of real estate. The apartment building occupied practically all of the site (except the U-shaped front court). The city passed an ordinance prohibiting overnight parking on any city street. It was, therefore, necessary to purchase land for automobile parking purposes. The land to the north was improved with two very old residences on lots of 40 by 125 feet each. All other adjacent property was improved with good apartment buildings. The apartment owners offered $3.00 per square foot of land for the residences, which was the market value of the land. The homeowners would not sell for this price but would accept $5.00 per square foot. Instead of paying $30,000, the apartment owners paid $50,000. In this instance the apartment owners were "captive" purchasers.

Under abnormal conditions, such as during a shortage of any type of property, a purchaser usually pays a premium to obtain immediate possession. On the other hand, a property subject to lease may sell for less than its market value when possession is not available until a later date. Such motivating forces may affect the validity of a sale as evidence of market value, i.e., the amount on which a willing buyer and a willing seller would agree, neither being under abnormal pressure.

All recognized definitions of market value make certain basic assumptions which include the following: Buyer and seller are willing and competent; neither is forced to act; each enjoys the freedom of choice; the seller receives all cash. Whenever these conditions are not present, the price may not represent the reactions of typical purchasers and sellers in the market. Examples include property which is being assembled, and purchases made under threat of condemnation. When property is being assembled, the purchaser is captive because he has no choice. When property is purchased under threat of condemnation, the owner may not be a willing seller. Since many transactions do not reflect market value, they should be explained, adjusted, or excluded.

Degree of Comparability. Exact similarity is seldom found between comparable properties used as market data and the property under appraisal. Occasionally in the case of residential property, and particularly when the property to be appraised is one of many built at the same time by the same builder, close and recent comparisons are found. However, market data evidence usually is obtained on properties which, although similar in major respects, are sufficiently dissimilar to require adjustment to bring them into line with the property being appraised. Also, some may have been recent sales, but others not. For example, in a rising market the market data pattern might be similar to that given in the following analysis:

ANALYSIS OF COMPARABILITY
FIVE SALES COMPARED WITH SUBJECT PROPERTY

Comparable Sale	*Price*	*Date of Sale*	*Number of Rooms*	*Comparison*
1	$17,000	5 years ago	7	Equal
2	15,000	4 years ago	5	Inferior
3	21,000	2 years ago	6	Superior
4	25,000	1 year ago	7	Superior
5	24,000	1 year ago	6	Equal

A study of this pattern indicates that the "equal" properties (1 and 5) increased from $17,000 to $24,000 in four years. Therefore Sale 2 tends to support Sale 1 as a fair price for that year. Sale 4 increased $4,000 over Sale 3 in one year. However, Sale 4 is rated a better house than the property being appraised and may be better than Sale 3.

Indications are that the property being appraised is worth as much currently as the superior property (Sale 4) was worth a year ago, or $25,000. There is much to be said for bracketing the subject property between two recent sales, one of a superior property and the other, inferior.

In dealing with sales comparisons of vacant land, the procedure is similar. The general rule is that closely comparable properties are sought first, but the less comparable or older examples are utilized to build a pattern into which the probable market price of the property under appraisal may be fitted.

A number of other factors should be noted in establishing the relationship of the comparative property to the one under appraisal, in addition to qualifying the sale as bona fide. The factors of time, neighborhood and location, also site and land improvement, as well as the building itself, and the income from the property are all highly significant considerations in an analysis of comparability.

Listings or Offers To Sell. Listings are potential market prices, and as such are analyzed in much the same way as are actual sales. The same qualifications are made: number of listings, period of time covered, terms (cash or contract), rate of turnover, motivating force, and degree of comparability. The number of listings frequently is a good indicator of a changing trend in use. If many people want to sell, the reason should be sought. Numerous listings in a limited area may mean competition between owners to sell, so that listing prices tend to approximate market prices more closely than they would otherwise. For example, there was a period following the depression of the 1930's when liquidating bank listings coincided with bottom selling prices, given a 20% down payment. A buyer could purchase these listings for 10% less if he paid cash, but nothing lower would be considered. At that time, listing prices were almost as good for comparative purposes as actual sales. After World War II, however, listings frequently had little meaning. Owners were optimistic, anticipating a market much higher than then appeared reasonable. In a modified way this condition, with only a few brief interruptions, has continued as a long-term trend.

The period of time for which a property is listed before it is sold affords an interesting study. The time factor varies with property types and market conditions. Assume that a very old frame residence, on land which was zoned for low-rise multiple-family building, was listed for $3.00 per square foot of land, declined in successive years to $2.50, $2.00, $1.75, and finally sold for $1.50 per square foot. Most of the owners nearby might have thought their land worth more than $1.50 per square foot, but the history of this listing suggests less optimism. In conclusion, when using listings as

market data, it is well to remember that they usually reflect the top of the range, and therefore, unless adjusted, are not acceptable as sound evidence of market value.

Offers To Purchase. Whereas offers to sell tend to indicate a ceiling on market prices, offers to purchase tend to indicate a floor. The offer to purchase is more likely to approximate the market price than is an offer to sell. A valid offer to purchase usually is made in all seriousness, whereas an offer to sell might be merely to test the market. When the offer to purchase is motivated by a special need, the price offered may exceed market value. Terms and motivating forces are key factors in qualifying a known offer to purchase.

Unlike listings or offers to sell, most offers to purchase are not common knowledge. The appraiser may not make any special effort to obtain such information, although he would be ready to use it, if it became available and if he lacked adequate market data. Nevertheless, offers to purchase and sell become more credible when they remain under an option; and still more credible when the offers to purchase and sell are supported by the signatures of both parties.

Summary

The market data approach is based on the principle of substitution and involves the process of comparing similar properties which have been sold in the market with the property under appraisal. Similarities and dissimilarities between the subject and comparable properties are noted. Such differences may be in time, location, and physical characteristics, including condition and functional utility. For investment property, income is also a factor. The information required by the market data approach calls for knowledge of the properties to be compared in order to establish the character and extent of the specific differences.

Pertinent data is obtained by identification and inspection of properties which have been sold that are comparable with the one under appraisal, and from deed transfer records, atlases, lease rec-

ords, published news, advertisements, informed sources, and direct interviews. The facts are assembled, filed according to location and type. Sales data is processed to the convenient units of measurement, such as per dwelling, per apartment, per room, per square foot, and gross monthly or annual multiplier.

In addition to the physical items, the appraiser considers the number of comparable sale properties and geographical coverage of data, period of time covered, financing terms, rate of turnover, motivating forces behind transactions, and in general the degree of comparability of the sale properties with the one being appraised. Listings for sale and offers to purchase may be considered and accorded weight, on their merits.

The actual comparison process, as set forth in the appraisal report, may require some type of statistical presentation showing adjustments which may be made by dollar amounts or percentages from the comparative properties to the property under appraisal. The degree of similarity existing between the properties establishes the differences for which there must be adjustment.

The market value for the property being appraised is developed by adjusting the sale prices of the comparable properties (up or down) to a dollar amount which is an indication of the effect of the differences on its market value. The inference is that the adjusted price of each comparable sale indicates the amount at which the property under appraisal would sell if offered in the market.

This procedure tends to produce an indication of value within a bracket, rather than a precise figure. When there is a sufficient amount of comparable data, such an indication is realistic. With more data obtained from additional comparable sales, the range of the indicated price at which the subject property would sell, if offered, narrows. The fewer the adjustments necessary to achieve comparability, the narrower is the range within which the indicated value may be found. In some circumstances—when, for example, a specific figure is difficult to establish—the appraiser may express his market data approach indication as a range.

The market data approach to a value estimate is direct and

easily explained and understood. Its application is difficult only for types of property for which comparable sales data is not available, or where excessive adjustments are necessary. It is ideal for types of property which sell frequently. It may be the only usable approach for properties which, because of age and excessive depreciation, combined with a lack of dependable income and expense data, are not suitable for application of the cost or income approaches.

In the collection and use of sales data, modern computers serve two purposes, calculation and storage. Modern computer techniques provide facilities for the storage and classification of sales data concerning different types of property and different locations, with instant access to the desired information. Whether the use of such computers is advisable in a given situation depends on the size of the appraiser's operation, the amount of information to be stored, and the practicalities of keeping it updated.

CHAPTER SIXTEEN

Market Data Approach—Application

THE GENERAL PRINCIPLES and procedures of the market data approach as outlined in the preceding chapter are applicable to all types of property commonly bought and sold in the market. It is assumed, in all cases, that sales have been screened for motivation factors which, if non-typical, would invalidate the sale as a reasonable indication of market value.

Dwelling Example

Assume that an appraisal is to be made of a single-family dwelling for an owner who is about to put it on the market. The house is 35 years old and located in a fairly well-preserved neighborhood. The dwelling is brick with four rooms (living room, dining room, kitchen, and single-story attached sunroom) and lavatory on the first floor, four bedrooms and two baths on the second floor, and one bedroom and bath on the third floor. Its condition is average, but piping and kitchen are original equipment.

There are five sales of nearby properties of about the same age which are generally comparable. The following data is developed:

Sale No. 1. A dwelling of brick construction. Four rooms and lavatory on the first floor; four bedrooms and one bath on the second. Maid's room and bath on third. Has a remodeled kitchen, but original piping. Condition is superior. Sold this year for $35,000.

Sale No. 2. Frame construction, four rooms and lavatory on first floor, four bedrooms and two baths on second; one room and bath on third. Has original kitchen and piping. Average condition. Sold one year ago for $35,000.

Sale No. 3. Frame house, three rooms and lavatory on first floor; four bedrooms and two baths on second; no third floor. Has remodeled kitchen, and piping replaced with copper. Average condition. Sold three years ago for $28,000.

Sale No. 4. Frame house, four rooms and lavatory on first floor; four bedrooms and one bath on second. Maid's room and bath on third. Has original kitchen but water piping replaced. Condition is considered to be inferior. Lot is pie-shaped and inferior to the typical lot. Sold one year ago for $30,000.

Sale No. 5. Brick house, four rooms on first floor; three bedrooms and two baths on second; no third. Has original kitchen, and piping has been replaced. Average condition. Sold two years ago for $28,000.

To obtain indications of market value of the property appraised, such generally comparable sales may be analyzed and adjusted as follows:

ANALYSIS AND ADJUSTMENT—SALE NO. 1

Price		$35,000
Time adjustment		0
Location and		
Neighborhood adjustment		0
Physical Characteristics:		
Lot value		0
Construction adjustment		0
Condition		—1,000
First floor rooms		0
Second floor rooms		0
Third floor		0
Second floor bath		+2,000
Lavatory		0
Remodeled kitchen		—2,000
Piping		0
Adjustment for differences in characteristics	minus	$ 1,000
Indicated market value of property being appraised by comparison		$34,000

After similar analysis and adjustment of the other comparable sales the appraiser may conclude that a market value range is indicated from $31,500 to $34,000. His experience and judgment in

this case may suggest something slightly more than an average; for example, $33,000 as a reasonable indicated value of the property being appraised by the market data approach.

There are a number of ways market data may be adjusted and compared, such as addition or subtraction by percentages; use of dollar amounts as has been demonstrated above; or narration of the differences, merely indicating why and to what extent each comparable is considered better or poorer than the property being appraised. Predicated upon his study of the data, and application of his experience and judgment to interpret and rationalize the implications of each individual sale, a pattern should emerge which leads the appraiser to a logical conclusion as to the indicated market value of the property being appraised.

Apartment Building Example

In another example, assume the appraisal of an apartment house. The appraiser has obtained data concerning it and also nearby similar properties that have been sold recently. All seem to be in good condition. A study of neighborhood data shows that the locations are of equivalent desirability, so that neighborhood adjustments are insignificant.

The principal units of sales comparison which may be applied effectively are dollars per room, gross rent multiplier, and dollars per apartment unit as shown in the comparable sales analysis which appears on the following page.

The subject is most comparable in apartment size to B, and in rental value per room to B and C. The lower rental per room for D combined with the higher GRM might suggest that the appraiser check to ascertain whether this means the rooms are less desirable or whether management has not been alert to maintain a rental schedule close to the market. If so, the purchaser may anticipate increasing rentals, thus reducing the GRM.

Since a difference in average number of rooms per apartment causes wide variation in the price per unit, the appraiser may decide to discard C and D as a meaningful basis of comparison.

GARDEN APARTMENT PROPERTIES
Comparable Sales Analysis

	Properties				*Property Being Appraised*	
	A	*B*	*C*	*D*		
Stories	2	2	2	2	2	
Years since sale	5	4	2	8	6	
Units	400	90	114	384	177	
Rooms	1724	455	678	1536	880	
Baths	535	135	171	384	247	
Rms/Unit	4.3	5	6	4	5	
Rental (time of sale)	$764,750	$218,500	$311,160	$571,400	$410,000	
Rental $/Room/Month	$37.00	$40.00	$38.20	$31.00	$38.70	
Sale Price	$5,000,000	$1,450,000	$1,850,000	$4,000,000	$2,650,000	*
Sale Price/Room	$2,900	$3,185	$2,730	$2,605	$3,000	*
Sale Price/Unit	$12,500	$16,110	$16,230	$10,415	$15,000	*
GRM†	6.54	6.64	5.95	7.0	6.5	*

* Market value conclusions developed from analysis of sales data.

† Gross Rent Multiplier equals sale price, or value, divided by gross income.

From such an analysis, among other things, the indicated value for the property being appraised could be rationalized as follows:

880 rooms @ $3,000‡	$2,640,000
$410,000 income × 6.5 (GRM)	$2,665,000
177 units @ $15,000§	$2,655,000
Indicated by market approach	$2,650,000

His inspection of the properties and his recognition of factors beyond those included in any summary, such as the above, all enter into judgment decisions leading to conclusions as to unit figures appropriate to the property being appraised.

Retail Store Property

In the absence of net lease information the gross (annual) rent multiplier (GRM) may be useful as a comparison unit in the market data approach as applied to retail business property. However, if there is not a reasonable degree of consistency between the operating ratios of the property being appraised and the sale properties, an indication of value by the gross rent multiplier may not be reliable or definitive.

Units of comparison include dollars per square foot of gross or net rentable area, in which case adjustment for locational or physical differences may be necessary. Use of an over-all capitalization rate★ derived from an analysis of similar property sales in the market may also constitute a desirable basis for comparison, but is usually considered to belong in the income approach to a value indication. However, since the over-all capitalization rate is very close to the market, it may be considered in the market data approach.

The following illustrates the application of the GRM and the dollars-per-square foot units of comparison obtained by an analysis of sales of comparable retail properties:

‡ Indicated market value per room. If the properties being compared involve dissimilar room sizes, comparison should also be made on the basis of dollars per square foot of rentable area.

§ Indicated market value per apartment unit.

★ Net income before deduction for recapture, divided by sale price. (Not to be confused with GRM, which is sale price, or value, divided by gross, or more often effective gross, income.)

RETAIL STORE PROPERTIES
Comparable Sales Analysis

	Properties				*Property Being Appraised*
	A	*B*	*C*	*D*	
Stories	1	1	1	1	1
Construction	Brick/Steel	Brick/Steel	Brick/Steel	Brick/Steel	Brick/Steel
Age in years	5	3	12	8	10
Number of stores	3	5	5	3	4
Rental area in sq. ft.	6,000	8,000	6,000	5,400	6,000
On site parking in sq. ft.	3,000	5,000	1,000	6,000	3,500
Gross rental at time of sale	$12,000	$17,600	$9,000	$12,200	$12,000
Tenant credit	A	C	C	A	B
Average rent per sq. ft.	$2.00	$2.20	$1.50	$2.25	$2.00
Age of sale	6 months	1 year	2 years	1 year	—
Sale price	$110,000	$140,000	$75,000	$110,000	$105,000♦
GRM	9.2	8.0	8.3	9.0	8.5♦
$ per square foot of gross building area	$18.30	$17.50	$12.50	$20.40	$17.75♦

♦ Conclusions developed from analysis of sales data.

A GRM is not usually subject to adjustment, since relative desirability in the market place is presumably reflected in the rental the properties can command. An exception may occur when there is a substantial difference in the quality of the rental streams. This recognizes that an income supported by a superior credit is entitled to a lower risk rate and therefore may command a higher purchase price.

Properties B and C are of construction similar to the property being appraised, but other factors indicate C to be less and D to be more desirable. Assume that, after inspection and analysis, B seems most comparable, but there is also substantial similarity between A and the subject.

The indicated value of the property being appraised could be rationalized as follows:

$12,000 income × 8.5 GRM	$102,000
6,000 square feet @ $17.75◊	$106,500
Indicated value by market data approach	$105,000

The above explanation is presented here to illustrate an orderly process that may be followed. It includes only a limited number of the many factors entering into a comparative analysis. Such analysis need not be included in the appraisal report to a client, or, if included, it may be in either narrative or summarized form.

Commercial—Light Industrial Property

The term commercial is used here to apply to garage-type structures, typical warehouses and light industrial buildings. In many localities this type of property is leased on a basis of the tenant paying all expenses except taxes, insurance, and exterior maintenance. Under these conditions operating ratios are reasonably consistent, and use of the GRM may produce a dependable value indication.

A unit expressed in dollars per gross square foot is also a valuable tool in the comparison process for different types and ages of

◊ Indicated value per square foot of gross building area.

one-story and multi-story industrial properties. Comparisons may be made by assigning square-foot units separately to the land area and to the building area, or the square-foot unit price may be assigned to the building area only, considering the land and its improvements as merged.

When the latter is used, the land-to-building area ratio should be reasonably typical. Excess land area, frequently acquired for future expansion, may distort a unit figure based upon the land-to-building area ratio for a typical property. If the land area substantially exceeds the typical, the excess should be segregated and its market value added.

Type of space represents another distinction. Construction cost for office area in any commercial type building usually is considerably greater than for shop space, and ordinarily is assigned a proportionately higher unit value.

As an example of an analysis of comparable sales in the market approach to value, assume a small, light-industrial building situated a mile from downtown on a major thoroughfare, built five years ago for owner occupancy. The building is 56-by-90 feet, on land 70-by-198 feet. The office space is 56-by-25 feet. It is modern in all respects, with paneled walls, asphalt tile floor, acoustical ceiling, and air conditioning. Office space of this type is judged at a premium of $5.00 per square foot over and above the rate for warehouse space in the same building. The value of the site is estimated at $1.50 per square foot. Assume further that the data search has disclosed, among others, two sales of properties comparable with the property being appraised, as shown in the following comparable sales analysis.

COMMERCIAL—LIGHT INDUSTRIAL PROPERTIES
Comparable Sales Analysis

	Comparable Properties		*Property Being Appraised*
	A	*B*	
Sale price	$65,000	$112,500	$78,000▲
Terms of sale	Typical	Typical	
Date of sale	2 yrs. ago	Current	
Adjustment for time	+10%	None	
Adjusted sale price	$71,500	$112,500	
Location	Inferior	Inferior	
Land rating, per square foot	$1.25	$1.00	$1.50
Land area (square feet)	11,600	18,000	13,860
Land allocation	$14,500	$17,500	$20,800
Net building allocation	$57,000	$95,000	$57,200
Office space premium, per square foot	$8.00	$5.00	$5.00
Office space area (square feet)	1,250	2,500	1,400
Office space premium	$10,000	$7,500	$7,000
Net to basic building	$47,000	$87,500	$50,200
Building area (square feet)	4,800	8,500	5,040
Indicated basic building value per square foot	$9.80	$10.30	$10.00

▲ Indicated market value.

Assuming close comparability of the open floor area, the indicated value of the property being appraised could be estimated as follows:

Building gross area:		
56 by 90 feet, 5,040 square feet @ $10.00		$50,400
Office premium:		
56 by 25 feet, 1,400 square feet @ $5.00		7,000
Land:		
70 by 198 feet, 13,860 square feet @ $1.50 = $20,790	Rounded	20,800
	Total	$78,200
	Rounded	$78,000

Single-story Industrial Property

With industrial property, as for store property, parking and yard space are extremely important. There are also many other

factors, as previously noted in the discussion on functional inutility.△

A case-study appraisal of a well-located medium-sized industrial plant, built 20 years ago, shows some, but not necessarily all, of these considerations. The building measures 100 by 220 feet, including offices (70 by 40 feet). Ceiling height in the clear is 14 feet. Lighting is good; column spacing is 20-by-20 feet. There are two truck docks, 30-by-60 feet, built into the building along the front. A depressed rail siding runs along one side, with doors spotted for unloading two cars at floor level. The land is 115-by-300 feet. The building is set back from the street. The only parking is for visitors and office personnel. If it had ample parking, as a matter of opinion, the property would be worth 20% more. A search discloses two similar and equally well-located properties that were recently sold.

> Property A is 10 years old, comprises 20,000 square feet, and is a branch plant with only a foreman's office. Ceiling height is 18 feet. There are two truck docks, but no rail. Land is slightly over an acre. Parking for 50 cars is considered adequate. Good light, column spacing 20-by-40 feet. Sold within six months for $200,000.
>
> Property B is 25 years old, comprises 25,000 square feet. Offices of 3,200 square feet. Ceiling height is 14 feet. One truck dock; rail siding on property at floor level. Land is approximately two acres, affording ample parking. Fair light; column spacing, 20-by-20 feet. Currently being sold for $200,000.

Adjustment factors are time, location, and physical characteristics which include, among others, land area for expansion, parking, age of building, shipping and receiving, column spacing, ceiling height, office facility and utilities, size and shape of building, type of construction, and land-to-building ratio. The rating of these two properties is shown in the table appearing on the following page.

Property A is better in many ways, but lacks rail and suitable office facility. Property B is poorer in three respects, but has better

△ Chapter on Commercial and Industrial Functional Utility and Inutility.

SINGLE-STORY INDUSTRIAL PROPERTY
Comparative Sales Analysis

	Properties		*Property Being Appraised*
	A	*B*	
Price per square foot (including land)	$10.00	$8.00	$7.50□
Time	Equal	Equal	
Location	Equal	Equal	
Land value (total)	Equal	Equal	
Expansion	Limited	Ample	
Parking	+15% better	+15% better	
Age of building	+10% newer	Equal	
Shipping and receiving	— 5%, no rail	— 2½% poorer rail	
Shipping and receiving	Equal truck	— 7½% poorer truck	
Column spacing	+10% better	Equal	
Ceiling height	+10% better	Equal	
Office facility	— 5% poorer	Equal	
Net result	35% better than subject	5% better than subject	

□ Indicated market value.

parking and expansion possibility. After comparing the various features of the property being appraised with those of Properties A and B, the appraiser might conclude that Property A is about 35% better, and Property B is about 5% better. The indication of value therefore is:

$$\$10.00 \div 1.35 = \$7.40$$
$$\$8.00 \div 1.05 = \$7.62$$

The appraiser concludes that the value of the property being appraised is $7.50 per square foot, or:

$$20{,}000 \text{ sq. ft. } @ \$7.50 = \$150{,}000$$

In the above, the gross square-foot sale prices are obtained by dividing the sale price of each comparable property, including both land and building, by the number of gross square feet in the building. The resulting prices per square foot are a merged unit because they include both the land and the building. When land

area and value are relatively comparable, such a unit is a practical measure of comparison between the property being appraised and the comparable sale properties.

Multistory Industrial—Warehouse

Multistory (so-called loft) space has become obsolete to many users because of lack of suitability for modern machinery, adding to the cost of manufacturing and of moving materials vertically, rather than horizontally.

As an example of a comparative market analysis of such a property, assume a five-story factory building situated in an established industrial area. Data has been obtained regarding two comparable buildings. A comparable sales analysis may be developed as follows:

MULTISTORY INDUSTRIAL WAREHOUSE
Comparable Sales Analysis

	Comparable Properties			*Property Being Appraised*
	A	*Resale A*	*B*	
Date	3 yrs. ago	1 yr. ago	3 yrs. ago	Now
Price	$600,000	$720,000	$700,000	$525,000**
Purpose	Storage	Mfg.	Mfg.	Mfg.
Land area	1.7 acres	1.7 acres	7.6 acres	2.6 acres
Stories	4	4	1 to 4	5
Construction	Concrete	Concrete	Concrete & wood	Concrete
Age	30 yrs.	32 yrs.	40 yrs.	31 yrs.
Gross area	173,600	173,600	225,800	169,070
Sale price per sq. ft., gross building area	$3.46	$4.15	$3.10	$3.10**
Percent first floor	27%	27%	36%	20%
Condition	Good	Good	Poor	Fair
Offices	Good	Good	Poor	Fair
Parking	Some	Some	Ample	Adequate
Expansion	None	None	Ample	None
Loading	Fair	Fair	Good	Fair
Elevators	Good	Good	Fair	Good

** Indicated value, land and building.

The above comparative properties that were sold are analyzed on a square-foot basis of gross building area, including all of the land:

3 years ago at $3.46 per square foot for Property A
1 year ago at $4.15 per square foot for resale of A
3 years ago at $3.10 per square foot for Property B.

It has been decided that the location and physical characteristics of Property A indicate that it is 20% superior to the property being appraised.

Property B, although not as good in some respects, has 36% of its area on the first floor, and ample parking, in addition to space for expansion which is somewhat unusual for an older loft property. Property B is assigned a 10% superior rating to the subject property. Furthermore, the demand is poor, and a 10% reduction in price from last year is in order. Since Property A is 20% better than the property being appraised, the indication for the latter is $4.15 per square foot, divided by 120% quality adjustment or $3.46, less 10% for time adjustment, or $3.11 per square foot of gross building area.

Indication of change in market since three years ago is the increase from $600,000 to $720,000 demonstrated by Property A resale, or a 20% increase. As applied to Property B, the indication for the property being appraised is $3.10 per square foot, divided by 110% quality factor or $2.82 per square foot, plus a net 10% for time adjustment, or $3.10 per square foot.

Therefore the indicated market values for the property under appraisal, both land and building, are $524,100 and $525,800, which the appraiser could reasonably call $525,000, reflecting a unit figure of $3.105 per square foot.

In both comparisons, reasonable adjustment was necessary, and the conclusions at $3.11 per square foot and $3.10 per square foot are unusually close, leading to a probable value conclusion of $525,000. Additional comparisons, if available, might either confirm this value conclusion or establish a reasonable range bracketing this figure.

Application to Other Types

Other convenient units may be used in measuring and rating different types of properties. Farm buildings are essentially related to the land they serve. The comparative value of farms is usually rated at so much per acre, buildings included and merged. In the balanced farm, the percentage of the whole accounted for by land varies according to type of farm operation.

The small or part-time farm is likely to be as much a residence as an income producer. The price, therefore, is higher, partly because there are more purchasers for smaller properties, and partly because the buildings constitute a greater percentage than those on a primarily income-producing farm. Therefore, the sale price of a 15-acre rural plot does not indicate the average value of a 300-acre farm.

Hotels and motels may be compared on both a unit basis and by a gross income multiplier.†† Office buildings may be compared on both the gross multiplier and square-foot basis. In cases where the cost of services is high and the ratio of net income before recapture to gross income is relatively low, the gross income multiplier tends to be lower. In such comparisons, the land may be either merged and included, or separated, in the indicated value estimate.

Net rentable area may be preferable to gross square feet as a unit of comparison when computed in accordance with established standards.

As an appraisal plant increases in size and usability, the appraiser finds that there are few properties on which meaningful unit comparisons cannot be made with similar properties that have been sold: theatres at so much per seat or per square foot, truck terminals at so much per door or per square foot, mobile home parks at so much per parking place, and golf courses at so much per hole.

†† Hotel accountants have another unit measure of value in the ratio of ad valorem real estate taxes to value. (Source: *Economic Factors and Case Studies in Hotel and Motel Valuation* (2d ed., American Institute of Real Estate Appraisers, Chicago: Author, 1968).

Number of Sales

The process of market data comparison has been demonstrated in this chapter using a limited number of sales. Increasing the number of comparisons—assuming that they are valid and applicable—tends to narrow the range within which the conclusion is to be found, and correspondingly increases the significance of the value indication.

The number of sales appropriate to a specific appraisal problem varies with the type of property, the defined value sought, and the importance of the market data approach to a solution of the appraisal problem. In a subdivision of almost identical residential improvements of similar age, a very few recent sales may produce a definite pattern and a narrow range of value, thus providing a well supported value indication for the property being appraised. Conversely, types of property which sell less frequently and vary widely in design and size make comparison more difficult. For such types, comparable sales analysis may produce a wider initial range of value indications, requiring more sales and study to develop a pattern leading to a supported conclusion.

Summary

The key to the market data approach is the use of units of comparison, of which a variety are available. Generally, there are such units applicable to single-family residences, retail stores, some types of commercial and/or light industrial property, hotels, motels, and office buildings.

Sale prices of comparable properties may be reduced to a multiple of gross or net income, sale price per square foot of gross or net rentable area, or per room, or per unit.

The emphasis placed upon elements inherent in the comparison process changes according to the type of property. Major elements to be considered in all cases are gross-to-net income relationships; also time, location, and physical characteristics. The physical considerations include many special components, such as parking,

room for expansion, bay spacing, elevator service, all types of functional inutility, as well as the usual items of age, contemporary standards of construction, its quality and condition.

In order to be used as a valid indication of market value, any comparable sale must be qualified as being bona fide and having characteristics similar or adjustable to the property being appraised. When there is a sufficient amount of comparable data, the market data approach indication is usually persuasive. When applicable, it is desirable that it also be supported by value indications resulting from application of the income and cost approaches.

CHAPTER SEVENTEEN

Gross Income Estimates

THE PRIMARY PURPOSE of making gross income estimates is to project probable net income benefits from ownership. These may be realized through use and occupancy or through a lessor-lessee relationship which produces a flow of income dollars. The first step in the development of a reasonable net income projection is an estimate of potential gross income expectancy. This is a critical estimate, and an error at this point may be compounded in the process of valuation. For example, if the gross income were $60,000 and the expenses were $30,000, then the net income would be $30,000. A 10% increase in gross income to $66,000 with identical expenses, however, would return a net income of $36,000 which, when capitalized, would produce a 20% greater value estimate.

In some situations, such as the appraisal of hotels and motels or furnished apartment buildings, the income estimate may include income attributable to furnishings or fixtures, not an integral part of the real estate but perhaps necessary to its operation. If such chattels are minimal, income attributable to them may be omitted from the estimate of gross, and only a real estate value developed. In other situations the appraiser, at some point in his analysis, allocates gross or net income between chattels and real estate, in order to ascribe separate valuations to the real estate and personal property.*

* In certain situations, where it is impractical to separate the operation of the real estate from the operation of the business conducted therein, a net income projection is further allocated between profit attributable to the business operation and a rental component attributable to the real estate.

The starting point in the estimation of projected gross income is the record of actual gross income from the realty in past years and the current revenue schedules. The historic and current facts concerning actual income are helpful in a projection of estimated future gross income. However, this projected gross income estimate for appraisal purposes may be quite different from actual past or current figures. In the review and analysis of the factual data, comparison is made with known rentals for similar space in the area under comparable lease arrangements. This analysis leads to an informed estimate of the probable volume of the prospective income stream from the property, and the degree of risk involved in its realization.

Economic Rent

Economic (market) rent is that which a tenant, using the premises for their highest and best use, is warranted in paying, and which the owner is warranted in accepting. This rent concept is the normal basis for a gross income projection in appraisal practice, and all such projections are based upon a reasonably foreseeable future, the extent of which varies with the circumstances of projection but conforms to the probable attitudes of experienced investors in the market. From the projected gross income the appraiser deducts estimated future expenses to arrive at a prospective net income estimate. This net income is then converted by the capitalization process into an estimate of value. In appraising a property by the income approach, the appraiser translates an anticipated future net income to a present value figure.

Past and present incomes, either gross or net, are significant only as indications of prospective future income. To conclude otherwise would be as illogical as to value the stock of a business concern on the basis of its past earnings paying a dividend of $1.50 per share for ten years, when the concern is now approaching bankruptcy.

The theory of the income approach, based upon the principle of anticipation, is that the value of a property is the present worth of

its prospective net income and/or benefits during the remainder of its productive life.

When analyzing gross income, the appraiser is concerned with its quantity, quality, and durability. The appraiser's evaluation of these three aspects of the income projection influences his method of processing the gross or net income.* This is because the prudent investor considers these same factors as a basis for comparing the relative desirability of similar investment properties.

Rental data on comparable properties includes actual rents, listings to rent, or offers to rent. The last two classifications are related to actual rent in the same way that listings to sell or offers to purchase are related to actual sales. The lease term and provisions of the lease must also be considered. Actual rentals may be classified as recorded leases, leases not recorded, and month-to-month rentals. Recorded leases provide desirable data because they are readily verified and can be cited without the limitations of confidential information. Unrecorded lease data can be equally helpful, but may be confidential or not available. Month-to-month rentals also may provide pertinent evidence, depending upon their circumstances.

Rents, leases, and sales are all included in the assembly of pertinent comparable data, together with consideration of the time and the motivating forces of the transactions. As in the qualification of sales data, the appraiser reviews an existing rental, established under the terms of a lease made some years previously, to ascertain its conformity with current market levels.

Quantity of Prospective Gross Income

In terms of rent, quantity refers to the amount earned in a year. The projection estimate reflects a consideration of the history and terms of existing tenant occupancy, a review of rentals being paid for comparable space and services, and an analysis of the rental level that is economically warranted for the premises. The current

* These factors also affect the selection of the capitalization rate, which is explained in the chapter on Interest Rates and Capitalization Rates.

environmental, economic, social, and political trends (both general and local) as well as conditions peculiar to the property and its location, exert an influence on the probable trend of the future income which it will produce. An understanding of these factors is essential in estimating the amount of income which an informed investor is justified in expecting. This figure may differ from past or actual current earnings.

A current rental received may be high or low in relation to the appraiser's opinion of the economic rent. If the actual rental is abnormally high, then the tenant may seek the first opportunity to cancel the lease, but in any case he probably will renew only at a lower figure after the lease expiration. If the actual current rental seems abnormally low, the owner of the property probably will seek an increase at the first opportunity. The existence of an apparently abnormally high or low lease or rental agreement currently in force may create either an excess over the estimated economic rent or a deficiency from it. Such excesses or deficiencies, where substantial, are usually isolated for special valuation treatment.*

The amount of rent stipulated in a lease may be affected greatly by the cost of preparing the space for specific occupancy, and by whether this cost is assumed by the lessor or the lessee. The rent may be lower than is typical because the tenant repaired, renovated, and perhaps altered the space at his own expense. The converse may be true if the landlord installed special partitions or made other expensive alterations for the use of the tenant. In the latter situation the tenant may be paying a typical rental rate plus an amount which is to amortize all or part of the alteration costs over the lease period.

The time element is important in all comparisons. General economic conditions which exist at one time may be quite different at another date even if not far removed.

* See section on Contract, Economic, and Percentage Rents in chapter on Direct and Straight Capitalization.

The appraiser places himself in the position of an informed investor in developing his prospective gross income estimate. The processing of this is an appraisal procedure. But such technical processing cannot lead to a satisfactory conclusion unless the starting point is a logical estimate of the probable quantity of future gross income. One guide to a valid projection of anticipated probable gross income is past and present performance of the property being appraised; another is the rentals being earned by similar properties; a third is the amount which present and prospective tenants are justified in paying. Regardless of what method is used to develop the economic income projection, the objective is a reasonable estimate of that rent which the property would command, for the foreseeable future, if the space were currently available for rent in the open market. This figure may be more or less than past or present actual gross income.

Concessions or the occupancy of a rent-free suite by the custodian of an apartment building may not appear in the actual income statement. However, an estimated rent may be assigned to the space on which rental concessions have been granted, with the amount of the concessions deducted later as an expense of operation.

The prospective gross income estimate (before provision for vacancy and possible rental collection loss) is also referred to as gross rental value. One of the more important factors in making rental estimates is the appraisal of stability or possible changes in environment of the rental property for the rental period considered.

Quality and Durability of Income

There is a fundamental difference between the tenant with strong financial responsibility and the tenant whose financial responsibility is uncertain or transitory. The property owner anticipates little risk in collecting the rent if his tenant is a major corporation that is financially responsible. Such a tenant—or one

guaranteed by it—frequently trades upon its desirability as a tenant to obtain a rent below the prevailing economic level. A building under lease to a corporation with strong credit is usually more attractive to investors and thus a lower risk rate may compensate, in full or in part, for the lower rental. However, if the appraiser considers that an existing lease has a favorable effect upon the value of the property being appraised, he examines the lease for provisions under which the tenant may be permitted to terminate the lease prior to its expiration (escape clauses). In the analysis of an income projection, an important consideration is probable durability. This probability is increased when a well-written lease is signed by a tenant who has financial strength. Since a prime location may also contribute to minimum vacancy, it enhances both quality and durability.

In office building properties, leases to tenants without financial strength may involve greater risk of collection and increase vacancy. In leases on retail store property, or single occupancy properties, the financial stability of the lessee may be the principal or even the sole security for the rental.

In the process of estimating potential gross income, the appraiser not only analyzes the quantity of income, actual or economic, but also formulates an opinion of the quality and probable duration of the income projection. The latter two considerations are important because they affect risk. The factor of quality or reliability is used later when deciding on an applicable investment risk rate in the capitalization process of the income approach to value.

Rental Definitions

A logical and intelligent estimate of the gross income requires an understanding, among other things, of the terms economic rent, contract rent, excess rent, percentage and overage rent. The definitions† follow.

† American Institute of Real Estate Appraisers, *Appraisal Terminology and Handbook* (5th ed., Chicago: Author, 1967).

CONTRACT RENT—Payment for the use of property designated in a lease. The term is used to establish the fact that the actual rent paid, or contract rent, may differ from economic rent. . . .
ECONOMIC RENT—The reasonable rental expectancy if the property were available for renting at the time of its estimation; the rental warranted to be paid in the open real estate market based upon current rentals being paid for comparable space, as distinguished from contract rent under an existing lease. . . .
EXCESS RENT (INCOME)—That part of the contract rental income which is in excess of the economic rent at the time of the appraisal. This might be temporarily due to such a factor as favorable location; or it might be more permanent because of a fortuitous lease or unusual management. In the income approach it is usually treated separately from the economic rental and may require capitalization at a higher rate and possibly a shorter income projection term. Synonym: surplus income.
PERCENTAGE RENT. . . . A percentage of the tenant's gross or net sales, as defined by the lease. . . . A minimum rent is usually included, although a straight percentage lease is occasionally encountered. Also it may provide for a ceiling rental. In effect, the percentage lease makes the landlord a partner in the tenant's business. [The percentage lease gives the lessor some protection against inflation.]

It is apparent from these definitions that percentage rent may be within the limit of economic rent or it may be at a level which includes excess rent. Overage rent refers to any rental received under a percentage clause in a lease which is above a guaranteed minimum rental. If the guaranteed minimum coincides with economic rent, then any such overage represents excess rent.

Types of Lease Agreements

An understanding of the factors affecting prospective income begins with a knowledge of the various types of tenancy. This chapter deals with gross income. Although some lease agreements may be on a gross basis with the lessor paying all expenses, others may provide for the lessee to pay part or all of the expenses. To compare one rental with another, certain provisions in the lease agreements should be analyzed, including the lessors' and lessees' respective responsibilities for the operating expenses, such as heat, power, and other utilities; also the exterior and interior building

maintenance; taxes and insurance including special coverage for boiler, plate glass, and elevators. An understanding of the effect of such lease provisions is necessary in order to estimate rental value in relation to a known lease of comparable space.

Another clause in a lease which affects net income flow is the escalation clause, whereby the lessee agrees to pay increased taxes or operating costs, or even to pay increased rentals based on some agreed-upon economic index or based on actual increases above a specified level.

The length, or term, of the lease has a direct bearing on the rent level. In static periods, the middle- to long-term lease (5 to 15 years) assures the lessor of continued occupancy without loss of rent. In a fluctuating rental market, a one-year lease may indicate that the owner anticipates a rise in rents, that the tenant anticipates a decline, or that for some other reason, one or the other is unwilling to be committed for a longer period.

Month to Month. This type of tenancy may or may not involve a written lease. The tenant may be compelled to vacate, or may decide to vacate, on short notice. A corresponding advantage to the lessor is that he, too, may cause the property to be vacated, thereby making it available for his own use or for leasing on more favorable terms.

Short-term Leases. Agreements of this type usually are entered into for five years or less. The terms and provisions may be set forth in short form or in detail, and frequently standard lease forms are used. Any type of short-term lease rental should be considered with due attention to re-rental costs, such as lease commissions or necessary expenditures of owner to prepare the space for new occupancy.

Long-term Leases. Such leases are usually considered to be those extending for ten or more years. The details of terms and provisions customarily are set forth in correct legal form. Often under this type of lease, the tenant desires, or is required, to spend considerable money for remodeling. If the property leased is land, he may undertake the construction of a building or other tenant improvements.

Percentage Leases. These may be short term or long term and are most frequently encountered in retail properties, where they may provide for the lessee to pay a percentage of his sales volume as additional rent over and above a basic guaranteed rental. The appraiser weighs the effect of such clauses on the future rent expectancy. He estimates whether the basic minimum or some higher figure represents a reasonable rental projection when the tenant actually is paying percentage income over a specified minimum. As the basic minimum may be either too high or too low, the appraiser gauges a rental projection on the basis of his past experience with other leases of similar character, for comparable locations, and in the light of specific factors pertaining to the property being appraised. The potential sales volume is one such factor.

Tables‡ are available that detail, by categories of retail businesses, the current percentage rentals being paid by various merchants, related to sales volumes. The general pattern varies from 1% to 15%, depending on the line of business, how successful the location proves to be, and whether the tenant is a member of a chain or is an independent outlet. Low profit and staple goods operations tend to be at the lower end of the percentage scale, with luxury goods in the higher percentage bracket. Exceptions to this general pattern include theatres, hotels, and parking lots, which generally involve higher percentage figures. Even where a fixed or flat rental is paid, with no percentage clause, the figure usually reflects a similar ratio of rental to prospective or actual sales volume.

Graduated Leases. These may be short-term or long-term leases, with or without percentages. The flat rent or minimum rent is adjusted up or down after an initial period. A step-up lease is designed to favor the tenant during the early years, with the landlord benefiting later as the tenant's business becomes better established, or as initial tenant expenditures for improving the real estate are amortized. Graduated leases also are employed to insure the landlord against a rental deficiency as his property increases in value. There are several forms of graduated leases, including those with

‡ National Institute of Real Estate Brokers, *Percentage Leases* (13th ed., Chicago: Author, 1973).

predetermined changes at specified intervals and those with changes related to some agreed-upon index or to periodic revaluation of the real estate.

Renewal Leases. These provide, at the time of negotiation, for an option for the extension of the lease term. Under this type of agreement, the tenant is permitted to continue occupancy at a fixed or graduated rent or at a rent to be determined by appraisal or arbitration. The cost-of-living index sometimes is specified as a basis for negotiating the rental conditions in the lease at the time of renewal.

Rental Unit Factors

The amount of data required to make a considered estimate of prospective gross rental frequently depends upon the complexity of the problem. The present rental schedule is the starting point for its solution. Audits, leases, and interviews with tenants during the course of the property inspection may be used to verify the schedule. Spot-checks and complete verification may be advisable in some instances.

The sum of the current rent schedule figures may be compared with the totals for previous accounting periods. Profit-and-loss statements for the last several years facilitate this procedure. Individual statements of the rentals paid, including that under a percentage lease or escalation clause, should be examined for each classification of tenant, such as for stores, or offices, wherever various types of tenants occupy the premises.

A useful procedure in estimating gross rental value is the collection and analysis of statements of rentals currently in force in comparable rental space. Such rental data is reduced to standard units of comparison. Lump-sum or total rental figures are usually difficult to compare; but when reduced to some common denominator or unit figure such as dollars per room, per square foot, or per square foot of net rentable area, they can be readily understood, making comparison practical. The total rental on a per-month or per-year basis is reduced to a common denominator of

the appropriate rental unit, which varies according to the type of property.

Apartment Property. The customary units in apartment property are rent per room per month or rent per square foot of rentable area per month or per year. Confusion might exist on the rent per room due to differences in definition and in standards. Use of the half-room tends to improve the accuracy but does not necessarily compensate for differences in room sizes, a factor which should be noted and reflected in the rate. The rental per room also varies between larger apartments and one- or two-room efficiency units. Corner apartments or those with a view customarily rent for more per room than do inside apartments. Data on current rates per square foot of rentable apartment area tends to establish a significant comparison of rental value within each class of apartments and provides a valuable supplement to a per-room analysis. Division into rooms establishes the utility of the total space, but the quantity of space is better reflected in the square-foot figure. Thus both are meaningful.

Retail Property. Two different units of comparison frequently used in the appraisal of retail property are dollars per (store) front foot and dollars per square foot of rentable area. For urban street frontages, with fairly consistent lot depth, the former provides a practical basis for comparison. With the increasing trend to shopping-center and free-standing retail improvements, the latter unit is generally more practical. Therefore per square foot of net rentable area per year has become the usual unit of comparison.

Industrial Property. Dollars per square foot per year is the unit generally employed in the valuation of industrial property, with due consideration to parking, loading, and yard service areas, together with any special services included. Excess parking or land areas should be valued separately. Gross area is used for single-occupancy property or for independently served space. Rentable net area may be used for industrial properties housing multiple tenants where service space is shared. Rental rates are affected by the services included and the character of the parking facilities.

Office Buildings. The rent per square foot of net rentable area is also the unit of primary importance in office building appraisal. Net rentable area may often exclude exterior and corridor walls, public or common washrooms, corridors, stairwells, elevator and mechanical shafts.[§] For example, when an entire floor is leased to a single tenant, the method of measurement varies, usually including as rentable area all space within exterior walls except that which also serves other floors, such as elevator, stairway, or duct space. Thus, the stated total rentable area of an office building may vary, within a range, with the extent of whole-floor or multiple occupancy, and with the method of area calculation.

Space may be classified to show premium rentals for the more desirable locations in the building, as well as special services and parking for tenants and outsiders.

Other Types of Property. For hotel and motel properties, the average rate per occupied room or per unit is the usual basis for comparison. This may be derived from the single occupancy rate to which is added an increment for double or family occupancy at an anticipated percentage. Parking lots and parking garages commonly are rated in terms of rental per square foot of area, or per car space. Truck terminals may be rated in terms of dollars per square foot per year, or dollars per door per month. Theatres are usually rated at so much per seat, although a rental per gross square foot per year, or a percentage rental, is also applicable.

Rental values of special-purpose properties, as well as other kinds, may generally be compared on the basis of per square foot per year. This square-foot unit is not applicable to some improvements—grain elevators, for example.

Having studied the existing rent schedule for the space found in his physical inspection of the property, the appraiser then reduces the figures to a unit basis. He is now in a position to ascertain whether the actual income is, in fact, economic or one which re-

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§ The Building Owners and Managers Association International (BOMA), *51st Annual Experience Exchange Report Office Building Operations, Calendar Year 1971* (Chicago: Author, 1972), pp. 82–86, presents one system of area calculation.

quires adjustment before it can be effectively used to project prospective future income.

Comparable Rents

A major consideration in estimating a gross income projection involves rental comparisons. At this point in his analysis, the appraiser has converted actual (or projected) rental to a dollar amount per square foot or other unit basis. Actual rentals for comparable properties, reduced to the same unit basis for comparison, with judgment adjustments for locational, physical, or other differences, may then be related to the above unit rental. This implements a decision on whether the current or projected rent for the property being appraised represents a reliable rental expectancy for the reasonably foreseeable future.

This analysis is expandable. If comparable rental data reduces to unit rentals different from those of the subject property, it is then logical to consider whether the latter is superior, equal, or inferior physically, functionally, or in location, and whether the tenants are equally responsible. The comparable unit rentals are considered in the light of these positive or negative factors. The rental projection for the property being appraised may then be adjusted to reflect the level of rental income indicated by this analysis.

In addition to the character and quality of the space, its condition, location, and other pertinent factors, attention should be given to the relative functional efficiency of the space. Assume one lease at the rate of 70 cents per gross square foot per year and another at the rate of 80 cents per gross square foot per year. If, in the first case, the ratio of net usable area to gross square footage were 80%,* the rent would be 88 cents per square foot of net usable space. If, in the second case, the ratio of usable space to total were 90%,* the rate per square foot of usable area also would be 88 cents.

* $0.70 ÷ 80% = $0.88, and $0.80 ÷ 90% = $0.88.

The development of comparative rents requires their reconciliation with the current actual and historical rents of the subject property—but not necessarily their conformance. Once he has analyzed comparative rentals and the differences between the comparable properties and the subject property, the appraiser is in a position to project for the latter a supportable estimate of gross rental for the reasonably foreseeable future.

Lease Analysis

It is not unusual to encounter a property that is leased at a rental which deviates from the economic rental level indicated by a market analysis. In this case, unless the property is to be valued on a free-of-lease basis, it is necessary to consider the probable effect of the existing lease upon rental value as defined in the appraisal.

In this analysis, the terms and provisions of leases involving the appraised property are carefully reviewed. The necessary lease information may be provided by the owner, but in most cases the leases require study by the appraiser. Many leases are long and complicated, and significant conditions may be included in the fine print. In some cases, legal interpretation may be necessary.

Data to be obtained from existing leases when making a gross income estimate includes:

1. Date of the lease
2. Volume and page number for reference if the lease is recorded
3. Legal description or other identification of the premises leased
4. Name of the lessor (owner or landlord)
5. Name of the lessee (tenant)
6. Lease term: the date of occupancy and the period of years over which it extends
7. Amount of rental; percentage clause, if any; graduation, if any; how payable
8. Landlord's covenants: responsibility for taxes, insurance, maintenance, and any other items for which the owner or landlord is responsible
9. Tenant's covenants: responsibility for taxes, insurance, maintenance, utilities, and escalation clauses covering increases in the cost of these items

10. Right of assignment: whether the leasehold (the tenant's interest) may be assigned and, if so, under what conditions, and whether assignment relieves the initial tenant from future liability under the lease
11. Option to renew: date of notice, term of years, rent, and any other provisions specified in the lease
12. Security: advance rent, bond, cost of improvements by the lessee or other party
13. Disaster: whether the lease continues; if so, upon what basis in the event of fire or other disaster
14. Lessee's improvements: whether these can be removed at the expiration of the lease, or to whom they then belong
15. Condemnation: the respective rights of the lessor and the lessee in the event that all or any part of the property is appropriated by a public agency
16. Revaluation clauses
17. Special provisions.

Effective Gross Income

Effective gross income is the anticipated income from all operations of the real estate after allowance for vacancy and collection loss. As shown, the purpose of the gross income estimate is to indicate the full potential quantity of an anticipated future rental income from the property and the degree of risk (quality) involved in its realization. Having arrived at this estimate of full potential rent expectancy, the appraiser proceeds to estimate the probable actual rent to be received or the anticipated future effective gross income.

In practice, a building, except under a blanket lease, is not expected to be fully occupied throughout its useful life or any major portion thereof. Frequently a new tenant is not found until after the old tenant vacates. Rental income may also be lost during remodeling or rehabilitation projects. Rent losses from a tenant's inability or unwillingness to pay may accumulate before the owner can resort to remedial measures. With occasional exceptions, then, the appraiser sets up a reserve to allow for vacancy and other causes of loss. This reserve factor, which is usually estimated as a percentage of potential gross, varies according to the

type of property, the tenancy, and general conditions. During periods of economic decline, allowance for prospective vacancy should be made in the light of these circumstances. In an era of depression and unemployment, or when overbuilding results in oversupply, the amount of particular types of space may exceed the demand, producing a general increase in vacancy. On the other hand, rapid expansion of demand coupled with an undersupply, due to a period of underbuilding, may create a situation where the prospective future loss due to vacancy is negligible. Obsolete types of property may anticipate some vacancy even when economic conditions are favorable.

The selection of an appropriate vacancy factor is influenced by the appraiser's estimate of the quality and durability of the projected rental. The vacancy allowance should be increased as the prospect of sustaining the estimated rent appears to be less assured. On the other hand, an annual allowance for vacancy could be unrealistic if a property were rented on a long-term basis to responsible tenants. The appraiser normally specifies in his report the potential gross income estimate, an allowance for vacancy and rent loss, and the resulting effective gross income estimate.

When the property being appraised is a new multi-occupancy improvement of substantial size, there may be an abnormally high vacancy in the early years while initial leasing is in progress. This may be of sufficient consequence to be reflected in the stabilized vacancy and loss allowance, particularly if the income is to be processed on basis of a short-term projection period, as under the mortgage equity method of capitalization. However, the effect of this consideration may be compensated for, in whole or in part, by a lower estimate for repairs, maintenance, and replacements during this limited projection period.

Income from services has been mentioned as part of the gross income estimate and, consequently, as part of the effective gross income estimate. This is not income directly attributable to the use of real property, but may be derived from the use of personal

property or profit from services supplied to the tenant. It requires analysis of its probable durability. Such income may include, for example, a profit derived from electricity purchased wholesale from the utility company and billed to tenants at retail, billing to tenants for special alterations, or other types of income paid by the tenants in addition to rental. This income may prove to be irregular or short-lived. Other examples commonly encountered consist of income attributable to special equipment, such as coin-operated washers and dryers in apartment buildings. If the income is attributable to hotel or apartment furnishings (chattels), this requires special treatment separate from the real estate in the income approach, although income from coin-operated equipment is generally part of service income. There are no set rules for the treatment of other income, as it is fundamentally generated by the operation of the real property and may be basically attributed thereto. Gross income from services may be included in the gross income estimate and the cost of services included in expenses. It is also possible to put only net profit from services in the gross income estimate or to show only a net loss in the expense estimate. This extraneous income should be specifically identified, so that it may be eliminated or separately treated if necessary.

Application of Gross Income Procedures

The actual income and expense statements with a current rent roll, showing gross income after allowance for vacancy and rent loss and other necessary adjustments, form a basis for estimating effective gross income of the property being appraised. This is usually set forth in an appraisal report, sometimes in a separate schedule, e.g., for multi-tenancy properties. The appraiser's gross income estimate, together with the stabilized expenses, constitutes the projected or reconstructed operating statement for the property. Pertinent lease terms also are included in appropriate detail. Sales figures, if available, may be included in appraisals of retail properties, inasmuch as this data is desirable to substantiate the

tenant's ability to pay the estimated rent. The report also includes an analysis of existing unit rentals in the property being appraised, and a reconciliation with comparable rentals.

In appraising apartment property, the appraiser studies the rentals on a dollars-per-room per-month basis, or per square foot of rentable area in buildings with comparable facilities—such as pools, recreation rooms, security provisions—before arriving at his estimate of economic rental. He studies the actual current rent roll for hidden concessions, disparities between units, and vacancies. As it may affect prospective vacancy and the cost of maintenance, the rate of tenant turnover is among the factors that are given consideration.

Store properties require that the appraiser review the basic types of retail development. There is the neighborhood location in which food, service, and convenience goods stores predominate, forming a small retail community. These may be independent free-standing stores or neighborhood centers in which the satellite stores frequently are not chain outlets. They seldom are on percentage leases, and lease terms customarily are short. The appraiser may arrive at a supported estimate of economic rent by comparisons and by investigation of the tenants' sales volumes.

Some retail types are free standing. Discount houses, service stations, and restaurants sometimes prefer locations apart from even small community centers.

Shopping centers may be neighborhood or regional. Factors such as the supporting area's purchasing power, competition, and the general state of business have already been considered. The appraiser may discover that key tenants—supermarkets, variety stores, and department stores—may be paying minimum rent; that is, less than the median front-foot or square-foot rentals being paid by other tenants for comparable space. Additional rents, to be paid by key tenants as percentage clauses in the leases may become operative, are important. They may or may not be components of economic rent. Additional rental income obtained by way of percentage is usually treated as overage income. Such overage rental

should be segregated for separate capitalization treatment in the valuation process, usually at a higher rate than the basic income.

Stores in central business districts comprise another category. Their characteristics are generally similar to those of main shopping-center outlets. But consideration should be given to decentralization and competition, public transportation, parking facilities for customers, and the tendency toward elimination of the independent merchant in central business districts. Customarily the key tenants are department stores which often own or rent under long-term lease the property they occupy. In such cases gross rental value may be estimated through application of appropriate percentage rental rates to retail sales volume.

Economic rental for theatres may be estimated on a comparative seat basis which varies with size, plan, attendance, location, and type of operation. Percentage clauses may be involved, and rental analysis on a square-foot basis is also appropriate.

Gross rental values of parking lots and garages may be analyzed on a comparative unit basis or as a percentage of income. Garages with ramps or elevators, (open or with pigeon-holes) are special-purpose buildings. Here the unit of comparison is the parking space. While parking facilities may be compared on a square-foot-of-area rental basis, they also must be analyzed in terms of car capacity. Even if similarly located, not all specialized parking facilities command the same rent because varying lot or building shapes and dimensions cause differences in capacity. Type of operation (self-park or other) is also a factor in parking garage analysis.

An understanding of office buildings' income involves a knowledge of their standards of operation. Guides for the analysis of their income and expense data are available.♦ It also requires an understanding of the local practice in renting office space. The rate to the tenant actually could be more than currently quoted square-foot rates because of requirements that the tenant pay for remodeling or other items. Leases may contain escalation clauses

♦ BOMA, *op. cit.*, for example.

requiring the tenant to participate in increased operating expenses.

Industrial buildings, manufacturing plants or warehouses, may be multiple-tenancy, single-tenancy, or owner-occupied structures. Economic rental values of the multiple-tenancy buildings are usually estimated on a comparative square-foot basis. Rental rates vary according to factors such as type of property, ceiling height, transportation facilities, and labor market. Vacancy rates often are more influenced by the district identity than some physical attributes of a more or less standardized industrial property.

Hotels and motels are not only income-producing properties; they are also complicated business enterprises in the analysis of which it is difficult completely to separate the business operation from the real property. The principal income is derived from room sales and food-and-beverage sales. Extra income may be provided by minor concessions or departments such as telephone service, cigar stand and valet service. The income from rooms, customarily the basic comparative item, is the product of the number of available rooms multiplied by the average rate per occupied room and by the occupancy percentage. Direct hotel operating expense is then deducted to arrive at a gross departmental room profit. The gross departmental profit or loss from other departments is then added or deducted, after which non-departmental general and fixed expenses are deducted to arrive at a net income projection imputable to the real estate, the chattels, and the business. Studies and monthly reports, unit room rental and occupancy rates, and departmental profits by cities and by other classifications are available.◊

Summary

The gross income estimate is the first step in the income approach of the appraisal process. The appraiser attempts to as-

◊ Harris, Kerr, Forster & Co., Hotel Accountants, *Trends in the Hotel Business* (Chicago: Author, annual).

American Institute of Real Estate Appraisers, *Economic Factors in Case Studies in Hotel and Motel Valuation* (monograph, 2d ed.; Chicago: Author, 1968).

sume the point of view of the fully informed investor, with respect to anticipated gross income. Existing lease agreements and the present and past income history of the property and of comparable space are reviewed in estimating the level of economic rental, the amount that the space should be expected to produce in the current rental market. Establishing the property's economic rental value by comparison with contemporary rentals involves reducing comparative rental data to units of comparison, such as per room per month, or per square foot per year. Information about personal income levels, business activity, retail sales volume, and the percentage of sales which a business can afford to pay are also valuable checks on the prospective quantity of economic rent obtainable in the market for a particular property, type of space, or location.

The rental to be received under a lease is called contract rent, and may be greater or less than present economic rent. Accordingly, in the estimate of effective gross income, the terms of existing leases are a controlling factor. Income in excess of economic rent is usually segregated for separate consideration, as discussed in the chapter on Direct and Straight Capitalization.

In addition to the prospective quantity of income, quality and durability are also important characteristics of a gross income projection. They are affected by tenant financial responsibility, the term and provisions of the lease, the age of the property, and strength of the location. These factors contribute to an estimate of the length of time that the prospective income is likely to be sustained.

Except in unusual situations, an allowance is made for anticipated vacancy and loss of rent. Effective gross income is that which remains after deducting a reserve for vacancy and rent loss from gross potential economic rent and service income. From the effective gross income, expenses are deducted to arrive at the net income estimate, the second step in the income approach, as explained in the following chapter.

CHAPTER EIGHTEEN

Analysis of Expense

As developed in the preceding chapter, the derivation of the prospective net income estimate from a real property begins with an estimate of economic rent plus income from associated real estate services. From this is deducted a provision for anticipated vacancy and collection loss to arrive at an estimated effective gross income. From this figure is deducted the appraiser's opinion of the prospective annual expenses chargeable to the operation of the property, after review of the historical operating data for the subject and similar properties. The remainder represents the net income projection for capitalization into a value estimate.

In analyzing expenses, the expense statement for any one year usually cannot be accepted as typical. Most expenses vary from year to year. Others, periodical rather than annual in character, may not occur at all in a specific year. Accordingly, in projecting the probable future expenses of operating the property, it is necessary to analyze more than one year's experience for the property being appraised, and to confirm the indicated conclusions by comparison with known figures for similar properties.

Periodic Fluctuation in Expenses

The principle of change teaches that nothing is static. Both income and expenses may fluctuate. They do not remain static in terms of fluctuating purchasing power of the dollar. They may or may not remain constant in terms of commodities.

The appraiser endeavors to reflect the attitudes of the in-

formed investor. He projects incomes and expenses in line with observable trends. Risk, due to future uncertainties, will be reflected in the capitalization rate applied later to the projected net income used in the income approach. The appraiser's judgment is not subject to criticism by the single fact that the income or expenses prove to be higher or lower than an estimate which he made 2, 5, 10, or more years previously. To be realistic in the light of all factual data at the time of appraisal, whatever projections are made need only to reflect the opinion of informed investors as of that point in time.

Classification of Expense

The deductions from gross income shown on profit-and-loss or operating statements fall into four general categories:

1. Operating expenses and repairs
2. Fixed expense
3. Reserves for replacements
4. Other charges.

These are discussed here in appraisal, rather than in accounting, terms.

Operating expense includes all out-of-pocket costs involved in providing services for tenants and maintaining the income stream, for example, administration, utilities, payroll, supplies, and contract work such as cleaning. Operating expense varies widely. Services provided to the tenants are usually minor in a store or a factory building, but may consume a large percentage of the income dollar in apartment buildings, office structures, and hotels. Repairs include everything necessary to maintain the property in rentable condition and in good repair.

Fixed expense, which may be shown on an actual or accrual basis, includes primarily real estate taxes and building insurance. These two items of expense apply to all properties except those leased on a net basis.

The reserve for replacement provides for adequate periodical

allowances for the replacement of short-lived equipment items, such as stoves, refrigerators, washers, dryers, air conditioning, and for portions of the building such as the roof, which require periodical replacement during the life of the building. When the remaining useful life of the structure no longer exceeds the life expectancy of the item, a replacement reserve need no longer be provided.

Besides operating and fixed expenses and reserves for replacement are items not usually constituting a proper deduction from effective gross income; they are omitted in the process of developing the appraiser's reconstructed operating statement. Such items might relate to depreciation reserves, additions to capital investment, mortgage interest and amortization, income tax, special corporation costs, or expenditures not essential or pertinent to the operation of the property.

Operating Expense

Although there may be more sophisticated subdivisions, this classification of expense frequently includes the following broad categories.*

1. Management
2. Electricity
3. Heat
4. Water
5. Gas
6. Air conditioning
7. General payroll
8. Cleaning
9. Maintenance and repairs
10. Painting and decorating
11. Alterations
12. Grounds maintenance

* A record of operating expenses for any particular building may be kept under a unified system of categories of expense designed by an association to which the owner may belong. Two such systems are shown later in this chapter. In other instances the record of operating expenses may be kept according to categories selected by the owner.

13. Supplies
14. Ash and rubbish removal
15. Miscellaneous other expenses.

Management fees (and rental commissions) are considered proper expense deductions, whether the property is managed by a professional manager or the owner. Management of a multi-tenancy property requires considerable outlay and heavy expenditure of time for accounting, supervision, and other managerial duties. The amount of management fees, usually established in terms of a percentage of effective gross income, may be influenced by local custom.

Legal, accounting, advertising, or other fees; items such as owner's or manager's telephone charges; bookkeeping and office rent should not be overlooked when they are necessary to the operation of the property. Since certain book charges, such as salaries of officers who actually perform no service, are not proper charges against the operation of the property, they are not usually included as expenses in the appraiser's reconstructed operating statement.

Retail chain-store tenants usually assume most of the operating expenses. For these properties, rental commissions may account for a major portion of management cost. Day-to-day management details are less burdensome when a property is leased to a single tenant.

Electricity is a cost which is generally recognized in the reconstructed statement with only minor adjustment. If the resale of purchased electricity at a net profit is permitted under existing agreement with the local utility company, any net income so derived may be included as service income without entry on the expense side of the statement. However, the cost of electricity for lighting public areas such as halls, corridors, and parking lots and power for elevators or other owner-operated equipment constitute an owner's expense, even when tenants are metered. When the owner provides electric service under the terms of the rental

arrangement (as in some apartments, hotels, and office buildings), the owner's electrical cost may become substantial.†

Heat is another basic cost carried to the reconstructed statement. The fuel may be coal, oil, gas, electricity, or public steam. The wages of engineers and firemen, and supplies and maintenance are included in this category under some methods of accounting. Public steam suppliers and gas companies keep records of the degree days from year to year. Reference to these records and fuel costs makes it practical to compare the most recent year or years with the average. Local anti-pollution ordinances specifying higher grades of fuel may result in considerable increase in future heating expense. The opportunity to change to a more economical type of fuel may result in a decrease in heating costs. This may require an expenditure for installation of new equipment.

Water cost customarily is incurred in the ownership of apartments, hotels, and other residential types of property. Comparative figures per family unit per year provide a basis for analysis. Usually domestic water needs are light in commercial properties; but exceptions are laundries, restaurants, taverns, and buildings that use water for air conditioning where there are no cooling towers.

Gas is a major expense only when used for heating or air conditioning. Tenants' gas is usually metered to individual units.

Air-conditioning cost is not always separated from the costs of electricity and water. For heating and air conditioning, there may be central systems, as in some large office buildings, or individual units in each tenant's space, as in store buildings and some apartment houses. When paid by the owner, the cost of inspection and maintenance is included in the operating expense. Air-conditioning costs vary widely but local standards provide a valid basis for operating cost comparisons.

Custodian or janitor service may be based upon union schedules in some areas. In others, the compensation is a bargaining matter

† State laws differ as to the legality of including electricity in the rent.

governed by local custom and practice. If custodial or managerial personnel occupy an apartment as partial payment for their services, its rental value may be included as income with an identical amount deducted as expense along with wages or salaries. For some properties there is the additional cost of employing watchmen, doormen, porters, or elevator starters.

For elevators, which are a major item of cost in office buildings, operation and maintenance may be carried in the same account. General payroll includes all employees not specifically assigned to other categories.

Cleaning is a major item of cost in office-building operation. This expense is usually estimated in terms of cents per square foot of the net rentable area. Its equivalent in hotels and apartments is maid service or housekeeping. Ratio figures based upon experience also may be utilized in estimating cleaning costs for hotel or motel operations.

Maintenance and repair includes roof repair, window caulking, tuck pointing, exterior painting, and structural work; and may include repair of heating, lighting, and plumbing equipment, depending upon lease provisions.

Decorating costs may include interior maintenance and minor repairs. Necessary provision for this category of expense varies according to local custom and may also vary from year to year depending upon supply and demand factors for the type of space.

Alterations are another phase of maintenance. If sufficiently extensive, they may be charged to capital addition, instead of to annual expense. The lessor may perform some alterations in the space rented, the expense of which may or may not be amortized by additional rental, or which, alternately, may be paid for by the tenant.

Grounds maintenance may be a major or minor item. Maintenance of a hard-surfaced public parking area with drains, lights, and marked car spaces, subject to intensive use and wear, may be substantial. Expense is entailed in the development of extensive grounds and parking areas serving such properties as garden apartment developments and shopping areas.

Unemployment and social security taxes may be carried in a separate classification or may be included in wages and salary.

Certain types of buildings in some areas require security provisions, which vary in cost according to the number of employees needed to control entries and exits and to circulate within the property. Further expense is incurred when provisions for security include electric alarm systems, closed circuit television, and flood lighting.

Supplies include the cost of cleaning materials and miscellaneous small items not carried elsewhere. Ash and rubbish removal and exterminating costs are usually contracted services.

Miscellaneous costs and items vary from property to property. However, if this category includes more than a minor percentage of the effective income, it should be analyzed, re-allocated, or clearly explained.

Fixed Expense

The current amount of the local real estate taxes is an item which may be specified with some certainty because tax records are usually public. The basis and method of their determination varies from place to place. First, in every instance, the appraiser should acquaint himself with the local system and the amount of the most recent years' tax assessments, rates, and amounts paid. He should not rely only on the amount of real estate tax indicated in an operating statement. There may be available information in the assessor's office about probable increases in assessment, the trend of the tax and assessment rates, with some indication of possible increases or decreases. At times, the actual operating statement shows only a partial payment or tax payments for a previous year, in which case proper adjustments should be made to project taxes and assessments on a realistic annual basis. Depending on his findings, the appraiser may use the stated taxes or he may adjust the allowance for taxes in the reconstructed statement. Where an increasing trend is indicated, some time may elapse before an additional increase becomes effective, whereupon

a moderate upward rounding of the figures is sufficient to provide for the reasonably foreseeable future.

If the property is found to be unfairly assessed, then an adjustment is in order. In cases of high or low assessments or apparent exceptions to the standard pattern of the jurisdiction, thorough analysis of the most probable amount and trend of taxes should be made. Records of changes that have been made in the assessment of the subject property should be studied. If the assessment is low, the assessor may raise it sooner or later; but if the figure is too high, relief may not be easily obtainable. Costly legal action may be required. In arriving at a final conclusion, the appraiser should provide for anticipated real estate taxes, as would an informed investor.

A cash operating statement may show insurance charges either at the actual annual cost or on the basis of premiums paid in one year which cover several years. For example, three-year policies may be more economical, and are almost standard. Since the insurance carried may not be the proper amount, the term and cost should be checked, and an adjustment made if appropriate. Fire, extended coverage, and owner's liability insurance are the principal items. Other types of coverage, which depend upon the character of the property, include elevator, boiler, and plate glass insurance. Rent insurance, intended to reimburse the owner for losses such as those incurred during a period of repairs, is another type of special coverage. Insurance on inventory and contents, or special liability, is usually a tenant's obligation and is not included. When there is doubt about the complexities of co-insurance, extended coverage, liability, or other types, it is advisable to seek expert counsel from professional insurance agents or brokers.

Reserves for Replacements

Where essential to protection of real estate operating income, items customarily provided for within this category for apartment properties include:

1. Stoves, refrigerators, dishwashers, garbage disposals, or laundry equipment
2. Furniture or lobby accessories
3. Carpet, linens, dishes, and other chattels
4. Specific building components
5. Machinery and equipment.

In the appliance category, this provision is made by estimating the total cost of replacement and dividing it by the average useful life of the appliance. In recent years there has been a growing tendency for more of this kitchen equipment to be built in, or for the landlord to provide coin-operated laundry units.

Furniture replacement is a major consideration in furnished apartments, hotels, and motels where the furniture is a principal factor in producing income. The annual allowance normally amounts to the cost of replacement divided by its useful life, depending on the type and quality of the different categories of furniture. Provision for a fair interest return on, and a recapture of, the investment in such chattels represents a separate consideration in the income approach to value.

Replacement of carpet customarily is treated by spreading the cost of replacement over a long enough period to arrive at a reasonable annual allowance. Linens, dishes, and silverware are short-lived chattels customarily figured for replacement in a comparatively brief interval.

The replacement of building parts deals with those integral parts of the structure which wear out more rapidly than the structure itself and are not covered by other maintenance charges. These may include the roof, boilers, elevators, store fronts in retail properties, or other items. The annual allowance for replacing roofs and boilers customarily is the total cost of replacement divided by an anticipated useful life. As elaborate, modern store fronts are subject to rapid obsolescence, an allowance for their replacement may be accrued annually over their estimated economic life. New elevators may or may not be expected to serve during the structure's remaining economic life. Items which are

expected to have a life equal to, or exceeding, that of the structure do not require a replacement reserve. The scope of items covered by the replacement reserve is a matter of appraisal judgment in a specific case.

A total expense estimate, including provision for all the items of repair and replacement, may exceed the actual expenditures shown on the owner's operating statements for the most recent or prior years. This applies when the building is reasonably new and when (as often in actual practice) the owner sets up no reserve for replacements. However, part of the ordinary repair expenditure may prolong the life of replaceable items; therefore in considering adequate provisions to cover repairs and reserves for replacement, they should be considered together, with care taken not to duplicate expense charges.

It is important to ascertain owners' and tenants' respective responsibilities for items of operating expense and to develop a reasonable program for operation of the property consistent with the character and terms of the lease or leases. Some types of leases contain escalation clauses which may include provision that all or part of any increase in operating costs and taxes above a specified level are passed on to the tenant.

Comparative Unit Costs and Ratios

After an initial estimate for individual items of expense based upon a computation of requirements, or a review of past operating experience, it is helpful to reduce these estimates to some ratio or unit basis for the purpose of testing and for comparison with experience standards of similar properties. Such standards are frequently expressed as a percentage of the income estimate or a dollar cost per room or per square foot.

The reference base is usually established by the appraiser's experience and often may be confirmed by published standards of experience for various types of properties, as noted later in this chapter.

The tendency toward a consistent pattern for many individual

items of expense for similar types of properties generally extends to the total expense ratio for such properties within a community. Total expense ratio refers to the relationship of the total expense estimate to the effective gross income estimate. All these ratios tend to fall within limited ranges for different categories of property. There is an advantage in immediately recognizing an approximately correct ratio of expense to gross income dollar, or conversely, the ratio of net income (before provision for recapture or future depreciation) to effective gross income.

Use of Income and Expense Statements

The present is rooted in the past; the future, in both. This saying applies to the review of a property's present and historical income, which is a basic step in estimating economic or stabilized rent. This step is accomplished through the process of comparisons with similar properties.

In stabilizing expenses the appraiser also proceeds from actual current and historical figures of the property. The historical record offers some indication of possible future expenses which are subject to adjustments for variations caused by known changes in prices and wages. These figures may be compared with those of similar properties as to both the over-all statement and specific expense items. This process makes possible a proper reconstruction of the expense statement.

The appraisal of real property is predicated upon the assumption of competent management, an assumption that might not be supported by historical operating statements. This fact, plus additional complications due to non-typical entries or the omission of specific items, may pose perplexing problems in the effort to reconstruct a typical expense projection. Nevertheless, operating statements for prior years are helpful to the appraiser even when they cannot be used exactly as presented. By combining the operating statements for three or more years with observations of the property and comparisons with the records of similar properties, the appraiser is able to reconstruct a realistic prospective or

stabilized expense estimate. The following tabulation may be useful to illustrate a reconstructed estimate of projected operating expenses for an office building, compared with the actual record of the three previous years.

RECONSTRUCTED OPERATING EXPENSE ESTIMATE
(000 Omitted)

	Preceding 3 Years			*Projected*
	3	*2*	*1*	*Stabilized*
Administrative/management	$ 17	$ 22	$ 21	$ 22
Cleaning	41	46	50	50
Electricity	3	4	4	4
Heating	6	6	7	7
Air conditioning	19	26	27	25
Plumbing	2	3	4	4
Elevators	9	10	10	10
Alterations—Space revisions	22	25	28	15
Decorating	7	11	10	9
General repairs and maintenance	2	3	1	2
Carpentry	1	1	3	2
General building	11	13	14	14
Insurance	—	—	12	4
Real estate and personal property tax	74	79	85	90
Franchise tax	1	1	1	—
Total	$215	$250	$277	$258

Examination of the experience of similar properties is a basis for deciding the probable validity of the various items of historical expense as shown on audits and periodic financial statements. Operating cost statements are published by various sources, including trade associations. The Institute of Real Estate Management has supplied an analysis of income and expense for apartment buildings.‡ The Building Owners and Managers Association

‡ *Apartment Building Income/Expense Analysis* (1972 ed., Institute of Real Estate Management, Chicago: Author, 1972). Figures are analyzed according to region and selected metropolitan areas.

International (BOMA) § has been compiling unit expenses for office buildings for more than 20 years. Laventhol Krekstein Horwath & Horwath,★ also Harris, Kerr, Forster & Company♦ publish studies in the hotel and motel fields. The Graduate School of Business Administration at Harvard University has analyzed (rental) costs for variety stores and food chains.◊ Costs for department and specialty stores are analyzed by the National Retail Merchants Association.▲

The pattern of items of expense as shown by the various trade organizations and their accountants usually follows an order which the particular group deems most suitable for its own needs. Accordingly, the items of expense may follow a different grouping for various types of property, as shown by the BOMA△ studies and those of IREM.□ Such published statistical material is frequently useful as comparison checks against expenses for a specific property.

The following tables taken from such periodic reports illustrate, in part, expense breakdowns in which the statistics may be presented.

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§ The Building Owners and Managers Association International, *53rd Annual Experience Exchange Report Office Building Operations, Calendar Year 1972* (Chicago: Author, 1973).

★ Laventhol Krekstein Horwath & Horwath, *Trends of Business* (monthly, Chicago: Author).

♦ Harris, Kerr, Forster & Company, Hotel Accountants. *Monthly Bulletin* (Chicago: Author).

◊ Now published by Cornell University, New York State College of Agriculture, *Operating Results of Food Chains* (annual).

▲ National Retail Merchants Association, Controllers' Congress. *Financial and Operating Results of Department and Specialty Stores* (New York, New York: annual. Originally published by Harvard University Graduate School of Business).

△ BOMA, *op. cit.*

□ IREM, *op. cit.*

Low Rise Apartment Buildings 25 Units and Over—Operating Expenses□
Selected City Averages—Dollars per Room per Annum

City:	*Atlanta*	*Chicago*	*Philadelphia*	*Los Angeles*
Number of Buildings	2	77	2	36
Number of Apartments	63	4,423	346	3,397
Number of Rentable Rooms	274	16,669	1,652	12,545
INCOME*				
Rents—Apartments (2)	$338.12	(77) $496.43	(2) $651.34	(36) $537.57
Rents—Garages & Parking	.00	(21) 25.17	.00	(6) 2.49
Rents—Stores	.00	(7) 35.69	(1) 3.85	.00
Rents—Offices	.00	(1) 28.36	(1) 3.98	.00
Gross Possible Rental Income (2)	$338.12	(77) $504.81	(2) $651.96	(36) $538.33
Miscellaneous Other Income	.00	(44) 2.42	(1) 14.70	(34) 16.18
Gross Possible Total Income (2)	$338.12	(77) $506.02	(2) $665.50	(36) $554.18
Less: Vacancies & Delinquent Rents (2)	5.71	(77) 47.21	(2) .00	(36) 44.59
Total Actual Collections (2)	$332.41	(77) $458.81	(2) $665.50	(36) $509.59
EXPENSES*				
Total Payroll Expenses (2)	$ 10.44	(77) $ 48.99	(2) $ 52.20	(33) $ 31.80
Electricity (2)	9.12	(77) 7.40	(2) 47.46	(35) 11.08
Gas (excluding heating fuel)	.00	(44) 4.86	(2) 11.10	(35) 6.84
Water (2)	10.14	(77) 8.17	(2) 12.94	(36) 7.99
Heating Fuel (1)	24.30	(73) 32.17	(2) 21.24	(12) 10.03
Management (2)	17.19	(77) 21.37	(2) 21.03	(36) 30.49
Other Administrative Expenses (1)	4.06	(61) 6.79	(2) 16.26	(31) 10.93
Painting & Decorating (int. only) (1)	5.23	(74) 15.95	(2) 13.00	(35) 15.49
Maintenance & Repairs (int. & ext.) (1)	14.63	(77) 23.51	(2) 20.17	(36) 21.89
Supplies (2)	3.77	(73) 8.12	(2) 1.50	(29) 2.10
Services (2)	3.44	(65) 6.99	(2) 10.64	(35) 5.69
Miscellaneous Operating Expenses	.00	(44) 9.99	(1) 3.57	(15) 1.79
Insurance (2)	8.20	(75) 14.46	(2) 10.32	(35) 5.45
Real Estate Taxes (2)	38.29	(74) 95.94	(2) 88.06	(34) 77.30
Other Taxes (1)	.89	(34) 1.80	(2) .69	(26) .40
Total All Expenses (2)	$121.70	(77) $292.05	(2) $329.89	(36) $225.37
Net Operating Income (2)	$210.72	(77) $170.64	(2) $335.61	(36) $284.22

□ Institute of Real Estate Management, *Apartment Building Income/Expense Analysis* (1972 ed. Chicago: Author, 1972). Figures in parentheses indicate total number of buildings reporting. Calendar year 1971.

* The calculations are based upon the number of rooms reporting the particular item. Averages and percents, therefore, may not total 100%.

Office Building Operating Costs□
Selected City Averages—Costs per Square Foot

	City:	*Atlanta*		*Chicago*		*Philadelphia*		*Los Angeles*	
	Number of Buildings	19		48		37		19	
	Building Rentable Area	5,724,761		17,380,056		7,820,623		4,742,021	
	Account	Bldg.	Total	Bldg.	Total	Bldg.	Total	Bldg.	Total
A1	Cleaning	28.4	(19)	85.8	(48)	79.7	(37)	72.2	(19)
A2	Lighting	23.4	(19)	15.8	(48)	38.4	(37)	26.6	(19)
A3A	Heating	9.7	(9)	30.5	(21)	25.2	(30)	8.9	(7)
A3B	Air Cond.-Ventilating	25.1	(9)	26.7	(16)	31.0	(30)	24.1	(7)
A3C	Combined Heat/Air Cond.	35.5	(10)	58.9	(27)	61.8	(7)	35.1	(12)
A4	Plumbing System	4.2	(19)	6.3	(48)	7.1	(37)	6.9	(19)
A5	Elevators	11.9	(19)	29.0	(48)	26.7	(37)	19.5	(19)
A6	Gen'l Expense—Bldg.	22.4	(19)	27.7	(48)	35.9	(37)	35.6	(19)
	Gen'l Expense—Admin.	32.0	(19)	31.4	(48)	14.9	(37)	18.5	(19)
	Total Operating 'A'	157.5	(19)	253.4	(43)	260.5	(37)	213.5	(19)
B1	Tenant Alterations	2.1	(11)	29.6	(38)	14.7	(13)	14.9	(8)
B2	*Repairs—Maintenance	6.4	(17)	18.3	(46)	17.9	(17)	11.4	(18)
B3	Tenant Decorating	1.6	(12)	9.0	(41)	6.0	(11)	4.0	(7)
	Total Construction 'B'	9.2	(17)	51.1	(47)	29.4	(20)	19.1	(18)
	Total A and B	166.2	(19)	302.9	(48)	278.4	(37)	231.2	(19)
C1	Insurance	3.1	(19)	5.5	(39)	6.5	(18)	5.2	(18)
C2A	Property Taxes—Land	13.5	(19)	38.7	(42)	14.5	(18)	20.1	(19)
	Property Taxes—Bldg.	52.7	(19)	136.6	(42)	49.9	(18)	77.2	(19)
C2B	Pers. Prop. Assessment	1.1	(6)	14.4	(8)	6.6	(4)	8.9	(6)
•	Total Fixed Charges 'C'	69.9	(19)	185.1	(42)	73.3	(18)	104.0	(19)
•	Total Expense A, B and C	236.0	(19)	494.7	(42)	373.8	(18)	335.2	(19)
•	Net Before Cap Chrgs.–Gain	186.5	(13)	202.4	(38)	232.2	(9)	133.3	(18)
	–Loss		(0)		(0)	17.8	(1)		(0)
C3	Depreciation	83.9	(18)	109.1	(24)	72.3	(8)	79.3	(16)
••	Net Before Cap Chrgs.–Gain	126.7	(15)	119.1	(19)	215.8	(4)	97.0	(9)
	–Loss	53.5	(3)	21.9	(1)	94.8	(1)	35.3	(6)
	Office Rental Income								
	Store Rent	667.7	(10)	565.4	(30)	1,292.9	(6)	567.3	(11)
	Basement Rent	147.6	(2)	459.9	(23)	66.5	(3)	192.7	(14)
	Special Area Rent	186.3	(7)	450.5	(9)	696.0	(4)	209.7	(13)
	Total Rental Income	417.1	(18)	650.7	(41)	588.9	(10)	455.5	(18)
	Miscellaneous Income	6.1	(10)	13.9	(30)	6.7	(6)	3.1	(10)
	Total Income	422.1	(18)	662.1	(41)	593.1	(10)	457.7	(18)

Continued on next page.

City:	*Atlanta*		*Chicago*		*Philadelphia*		*Los Angeles*	
Avg. Sq. Ft. Per Person	194.8	(12)	184.6	(33)	145.1	(25)	198.3	(18)
Operating Ratio	75.7	(18)	83.5	(20)	69.7	(5)	87.4	(15)
Management Ratio	39.2	(18)	42.1	(41)	50.6	(10)	48.4	(18)
Avg. Office Vacancy	4.9	(19)	3.2	(48)	1.0	(37)	8.7	(19)
Avg. Office Occupancy	95.1	(19)	96.8	(48)	99.0	(37)	91.3	(19)
Bad Debt Loss	.8	(19)	.2	(48)		(37)	.4	(19)
Labor Cost	33.7	(17)	121.3	(30)	139.0	(22)	68.2	(12)
Avg. Office Tenant Sq. Ft.	2258	(18)	3498	(39)	2941	(31)	5475	(12)
Avg. Store Tenant Sq. Ft.	3668	(10)	2899	(30)	5469	(16)	5360	(9)
Avg. Sq. Ft. Per Employee	19553	(17)	7238	(30)	4652	(22)	11126	(12)

* Includes alteration and decorating in non-rentable areas
( ) Indicates number of buildings giving this information
• Does not include expense for depreciation
•• Includes expense for depreciation

□ The Building Owners and Managers Association International, *53rd Annual Experience Exchange Report Office Building Operations.* (Chicago, Author, 1973). Calendar Year 1972. Their table also shows allocation to Rentable Office Area and Rented Office Area.

Net Income

The appraiser is concerned with developing reasonable estimates of potential gross income, effective gross income, expenses, and the prospective net operating income (before provision for projected depreciation—recapture—and mortgage debt service). See page 343.

Not included in the estimate of expenses leading to this figure are these items:

Reserve for Depreciation. The actual reserve shown on the profit-and-loss statement is usually based upon historical cost. However, the appraiser looks at the property as if it were on the market today. He then processes operating income separately from any allowance or reserve for projected depreciation, which may be shown, if required for financial purposes. Provision for recapture (future depreciation) is inherent in the capitalization method selected.

Mortgage Interest and Amortization. Interest is a charge for borrowing. Amortization is a return of a loan by installments. These items do enter into the mortgage-equity method of capitalization (see later chapters on rates and annuity capitalization).

They are not properly included as expense items in the appraiser's operating statement.

Income Tax (except in special situations). The amount of this item varies with the character of the ownership. The owner may be a corporation, a public utility, a wealthy individual, or perhaps an individual in moderate or average circumstances. The income tax costs of the owner, like mortgage interest and amortization, are not usually proper inclusions in the operating statement.

Special Corporation Costs. Items such as franchise taxes and directors' fees are charges against the type of ownership, not charges against the property.

Additions to Capital. These are not items of annual expense. They are capital additions that usually tend to increase or prolong the income and to extend the useful life of the property.

Summary

The forecast of annual expense is as essential to the income approach as is the gross annual income estimate. Current and historical expenses constitute only a guide to estimating future expense. Subject to actual lease provisions, the operating expense, fixed expense, and reserves for replacements usually constitute deductions from effective gross income in estimating net income. Not usually included among the projected annual expense estimates for appraisal purposes are depreciation reserves, mortgage charges, income tax, corporation tax, and capital additions.

Units of comparison and over-all percentages are helpful in analyzing the record of actual expense and for developing and refining the expense estimate. The end product of the carefully devised reconstructed income and expense statement is net income before provision for recapture of invested capital and before debt service. The following three chapters demonstrate the processing of this net income before recapture into an estimate of indicated value by use of various methods and techniques of capitalization available to the appraiser.

CHAPTER NINETEEN

Interest and Capitalization Rates

Capitalization is a process which translates an income projection into an indication of value. The connecting link is a rate which reflects the return necessary to attract investment capital. Hence the selection of an appropriate rate represents a critical factor in the capitalization process.

Prior to a discussion of rates or rate selection, a study of terminology is in order. Since certain terms, when used in accounting or financial fields, may involve a more limited concept than in the context of appraisal practice, the following definitions apply particularly to appraising.

Rate—A term expressing a fixed relationship between two magnitudes, and used as a means of measurement or to derive one magnitude from the other. A ratio of income to capital.
Interest Rate—A rate of return on capital. In appraisal practice, often synonymous with risk rate.
Yield Rate—Analogous to interest rate. Commonly used in connection with return on equity capital.
Capitalization Rate—Any rate used for the conversion of income into value.
Risk Rate—The rate of return necessary to attract investment capital.
Recapture Rate—The rate at which a capital investment is assumed to be returned to the investor. Usually considered in relation to investment in a wasting asset.
Building Capitalization Rate—The sum of the interest (risk) rate and the recapture rate, applicable to income imputable to improvements.
Over-all Rate—In the context of appraisal practice, the direct relationship between net income before recapture, and value or price.

The over-all rate includes both interest on, and recapture of, the investment.

INCOME—Money or other benefits, generally assumed to be received periodically.

CAPITALIZATION—The process of converting into present value (or obtaining the present worth of) a series of anticipated future periodic installments of net income.

REVERSION—(a) The return of an item of real estate, such as the return of all rights of possession at the maturity of a lease, or (b) the net proceeds of resale of the real estate at the end of a period of ownership.

VALUE—The quantity of one thing which can be obtained in exchange for another. In real estate valuation it is the amount of money deemed to be the equivalent in worth of the property being appraised.

Additional information may be found in *Appraisal Terminology and Handbook.**

A basic principle of real property value is that of anticipation, which affirms that value is created by the expectation of future benefits to be derived from ownership. The past is relevant only to the extent that it furnishes a basis for future expectations. Real estate value, consequently, is the present worth of the benefits of ownership as anticipated by typical prospective purchasers who constitute the market.

Capitalization is the procedure of expressing such anticipated future benefits of ownership in dollars and processing them into a present worth at a rate which is attracting purchase capital to similar investments. As employed in the income approach, this procedure uses a projection of periodic income as the numerator, with a capitalization rate as the denominator, in an equation for value. The process is most directly applicable to the appraisal of the value of income-producing property because a primary benefit of such ownership is income in the form of net rent. An expectation of income is a primary motivation for the purchase of income real estate. Return in the form of interest is measured by the year, and

* *Op. cit.*

is expressed as an annual rate. For example, an investment yielding 10% is one on which the return equals ten cents each year on each dollar of capital remaining in the investment from year to year.

The phrase, "remaining in the investment from year to year," is of special significance because a net return cannot exist until provision has been made to recover all purchase capital and all other costs attributable to the investment. Part of the net periodic income is normally allocated to the recapture or amortization of purchase capital, and the balance, plus any appreciation in capital value, is profit which is discounted to present worth.

Profit from the purchase of income-producing real estate generally is the excess of two collections over cost. As will be further developed in the chapter on Annuity Capitalization, the first collection is the periodic net income produced by the property during the term of ownership. The second collection is the net proceeds of resale at the end of the term of ownership. This is called the reversion. Thus the capitalization process may be accomplished by estimating the present worth of an income stream for a certain term of years, and the present worth of a lump sum reversion at the end of the term. Any estimate of value, regardless of the process used, reflects a summation of these two value components.

Interest Rates

Generally the interest rate to use in an appraisal problem is that which investors in that type or class of property require as a condition for purchase. The rate which such investors require varies from time to time, depending upon economic and other conditions. Accordingly, in establishing interest and capitalization rates, the appraiser carefully considers competitive market conditions, insofar as they influence or reflect opinions and actions of investors.

All investments—real estate or other—are in competition. The investor has the choice of bank rate securities such as government

bonds, industrial or municipal bonds, debentures; stocks and other securities; and selected enterprises or other real estate investments at varying rates of return.

Considerations of risk, burden of management, degree of liquidity, and other factors (including personal preference) act to affect the interest rate acceptable to the investor, from a specific real estate investment. An adjustment for risk is an increment added to a base or safe interest rate to compensate for the extent of risk believed to be involved in the use of the capital sum. Additional upward adjustment of the rate because of a need for management is that increment added to compensate for the cost, in time or dollars, involved in managing the investment. This must not be confused with a fee for managing the real estate itself, which is an operating expense unrelated to the investment interest rate.

The upward adjustment above a safe interest rate, in order to compensate for non-liquidity, results in an increment applying generally to real property because of the time often required to realize cash from resale of the property. This may vary with the general marketability of the type of property and the amount of the cash investment required.

In recognition of the above, an interest rate appropriate to real property investments may be rationalized in the following terms:

	%
Safe rate (minimum risk)	x
Add for additional risk	I_1
Add for non-liquidity	I_2
Add for burden of management	I_3
Rate applicable to the investment	Total

This summation provides a theoretical presentation to justify or explain why a rate used in the valuation of real property is in excess of the "safe" rate. Nevertheless, because of the intangible character of the components, it is not considered a valid procedure through which a specific rate may actually be derived. Procedures

applicable in the selection of specific rates are presented in the remainder of this chapter.

Influence of Income Quality on Interest Rate

The nature of income has been discussed in the chapter on Gross Income Estimates, in which the income from real property was analyzed in terms of quantity, quality, and durability. After analysis of gross income and deduction for vacancy and operating expense, a quantity of prospective net income before recapture is derived. The quality element of net income is interpreted in terms of risk, expressed in terms of an interest rate acceptable to the investor.

The capitalization of net income from income-producing real estate is at a rate commensurate with the risk of realizing the anticipated benefits. In this respect it is no different from any other investment. The yields expected from all investments reflect the risks involved, as viewed by investors in the market.

The term risk, as here used, connotes not only relative safety, but also the degree to which all the requisites of a good investment are met. An investment may be quite safe as far as principal is concerned, but may have other qualities which make it less desirable. Among the requisites of a good investment are:

1. Safety: the degree of certainty of return of capital is a prime consideration.
2. Reliability of yield: important because many investors are primarily concerned with income.
3. Marketability: essential prerequisite to liquidity, which may be important at some point in the anticipated life of the investment.
4. Denominations: amounts that can be handled by typical prospective investors in the market. Smaller denominations improve liquidity.
5. Acceptability as collateral: enables an investor to achieve a measure of liquidity without losing title to the investment.
6. Suitable duration: some people prefer a long term investment for their funds, whereas others prefer a short period only.
7. Freedom from care: important because many of the investors

managing their own portfolios do not want an investment requiring a great deal of attention.
8. Potential appreciation: provides a hedge against a decline in the purchasing power of money.
9. Tax advantage: tax savings or shelter may be an important consideration.

Any investment risk rate reflects the extent to which these factors modify the basic "safe" rate found in the money market.

The Over-all Rate

The projection of periodic income† is related to the value estimate by a composite or "over-all" rate. For example:

$$\frac{\text{Net Income}}{\text{Over-all Rate (R)}} = \text{Value}$$

$$\frac{\$36{,}000}{.09} = \$400{,}000$$

This over-all rate may now be analyzed in terms of probable amount and duration of the future income stream, reasonable provision for anticipated depreciation,‡ and the resulting probable interest return to the investor. Because the numerator in the equation is income only, it is apparent that the over-all rate of the denominator must be a combination of several ingredients, which will not only reflect a satisfactory return on the investment, but also adjust for any expected depreciation (or appreciation) of the asset.

Recapture may occur as a result of several conditions. If the value of the property at reversion (the net proceeds of resale) is the same as the initial investment, the entire recapture is in the reversion. If the value of the property at reversion is less than the investment, the recapture is only partially in the reversion, and

† Net income before provision for recapture and debt service.

‡ Depreciation in terms of dollars as of the date of appraisal is normally anticipated. Appreciation may occur, particularly in terms of future dollars.

the balance is in the income. If the reversion is greater than the investment, it provides all of the recapture and part of the profit.

In the above example, the over-all rate is 9%, which also would be the interest return if the value of the property would neither increase nor decrease. If there were a decrease, part of the income must be allocated to a commensurate amount of recapture, which reduces the interest return to less than 9%. Conversely, if there were an increase in value, a gain would be realized in the reversion; therefore the interest return would be greater than 9%. If the above rate of 9% reflects the action of typical buyers of that particular type of real estate, it is a valid over-all capitalization rate applicable to like property.

This over-all rate may now be explained in terms of the critical factors in any capitalization method: amount, time, yield, and provision for recapture. There are several methods for processing these factors into a value conclusion, each incorporating certain basic assumptions as to the anticipated income flow. In each appraisal the appraiser forms certain basic assumptions as to these critical factors of amount, time, and yield as they relate to anticipated income for the property being appraised. Because these basic assumptions are the result of the appraiser's judgment, he should not change his capitalization method without having first changed these assumptions.

In its most persuasive form, the capitalization process comprises an analysis of the property being appraised as an investment opportunity. The all-important question is: What are the prospects for yield on the cash-out-of-pocket (or equity) investment that the typical prospective buyer must make to acquire the rights of ownership? Clearly, the potential reward, in amount, time, and yield, must not only be attractive in the light of management burden and the risk of error in projecting the benefits of ownership, but also it must compare favorably in yield and benefits with alternative investment opportunities available. The over-all rate at which comparable properties have been bought or sold is factual

support of a market capitalization rate acceptable to typical prospective purchasers.

Rationalization of this over-all rate, in terms of amount, time, and yield of the anticipated net income, makes it possible to select a capitalization method suitable to the property being appraised. This will be demonstrated in this and the two succeeding chapters.

Influence of Income Tax Benefits

Certain types of property may attract purchasers in high income tax brackets who, because of tax benefits of ownership, buy on the basis of what appears to be a low over-all rate and a low return on their equity purchase funds. Such rates may not be an indication of capitalization rates currently applicable to such properties. However, they are valid if there are sufficient potential buyers in this category to constitute a market, so that the property is resalable at the purchase price.

Estimate of Interest and Recapture Rates

In the chapters dealing with gross income and operating expense, the end result of subtracting expense from income was net income before recapture. Having established an over-all rate in the market applicable to the property being appraised, the appraiser rationalizes a projected net income flow, and its breakdown between return on, and provision for recapture of, capital. From this analysis he may arrive at a conclusion as to a logical appraisal procedure that will fit the conditions and prospects for the property being appraised.

The investor in income property anticipates receiving a return on his investment. He also expects to recover, in the income or the reversion, that part of his investment in the property which might depreciate with the passage of time. With proper maintenance, well-constructed buildings are not subject to rapid physical deterioration. The time at which the building becomes useless frequently occurs more through a combination of economic or functional obsolescence than physical deterioration. Consequently, an

anticipated recapture period is usually called estimated remaining economic life.

It is difficult to estimate remaining economic life or remaining physical life. Investors and appraisers have gradually come to describe remaining economic life as the period over which an investor would expect to recapture his investment. This still poses a problem because prudent investors do not agree on the length of time in which a particular building investment should be recaptured. Accordingly, the individual investor might consider an annual rate for recapture of the investment, based either on a remaining economic life estimate or on an annual loading rate[§] that reflects his opinion of an adequate amount (an addition to return) to compensate him for the relative risks of future depreciation. Conversely, prospects of future appreciation might be considered by the investor as a favorable factor reducing the interest risk rate.

Land, which generally is not subject to depreciation, usually can be leased and sold on the basis of an appropriate interest rate, reflecting the risk of ownership. Land improved with a building often sells on the basis of a higher over-all rate than that for land alone. Since there is no reason to believe that the building itself should command a higher rate of interest than the land, the difference between the land interest rate and the combined over-all land and building rate must represent an addition to the interest rate or a surcharge, providing a margin to compensate for anticipated depreciation of the building.

Recapture Rate Extracted from Sale

Sales may be analyzed to establish a market interest rate on a particular class of real estate, by use of capitalization methods which have inherent assumptions that fit the property. Assume that these facts apply to a 10-year-old building:

Sale price	$400,000
Net income	36,000

§ An annual addition, or surcharge added to the interest risk rate.

In the judgment of the appraiser, after a market analysis of vacant land sales, the price may be allocated:

Land	$ 80,000
Building	320,000
Sale price	$400,000

The over-all capitalization rate reflected by this sale is 9%.

$$\frac{\$\ 36{,}000}{\$400{,}000} = .09$$

If the annual rate of interest return on similar properties is believed to be 7%, the 9% over-all rate at which the property was sold may be thus analyzed, within the concept of straight capitalization with straight-line recapture as presented in the following chapter:

Net income before provision for recapture		$36,000 per year
Sale price	$400,000	
Interest rate on land and building	.07	
Less interest		—28,000 per year
Available for recapture		$ 8,000 per year
Ratio of recapture installment to building value: $8,000 to $320,000, or 2.5%		
Recapture rate demonstrated is 2.5% per year.		

In accordance with the recapture rate derived above, the $36,000 net income before provision for recapture is allocated as follows:

	Rate		*Value*		*Amount*
Land interest	7.0%	×	$ 80,000	=	$ 5,600
Building interest	7.0%	×	320,000	=	22,400
Building recapture	2.5%	×	320,000	=	8,000
Total			$400,000		$36,000

This method of sale analysis, based upon a straight capitalization concept, assumes that the typical buyer is one who would pur-

chase this type of property for cash on the basis of a 7% return on invested capital after a provision for recapture of the building investment at the rate of 2.5% per year.

A recapture rate thus obtained does not in itself reveal the remaining life expectancy of the building. If future net income is expected to decline as a result of building depreciation, the net income of $36,000 shown above may be viewed as the first-year income level, and the annual building recapture of $8,000 might be interpreted as a provision for gradual recovery of the $320,000 building value over a 40-year life. If the future net income is not expected to decline, the $36,000 figure could be viewed as a stabilized annuity. According to annuity tables, the recapture rate of 2.5% in company with a 7% interest rate would then suggest a recapture period of approximately 20 years.* The relationships between stability of income, interest rate, recapture rate, and recapture period are discussed further in the following chapters on Direct and Straight Capitalization, and Annuity Capitalization.

Appraisers who follow their past work and test market reactions may find that buildings to which a remaining economic life of 40 years was assigned, 20 years ago, still have a remaining economic life in excess of 20 years, as tested in the market today. This is not difficult to explain since a recapture rate is not necessarily a direct reflection of a number of years; as already mentioned, this may be considered a surcharge or loading, added to the interest rate. This will correspond with, and reflect the action of, the market. It is also possible that the economic life of the building in question has been extended by renovation, by capital expenditures, or by other environmental or economic changes since the original projection.

Investors may not specifically consider a certain period of years as an estimated remaining economic life, but they may reflect the

* $36,000 net income, present value of ordinary annual annuity for 20 years, 7% interest; factor 10.594 (Appendix B, 7% Table, Column 5): $36,000 × 10.594 = $381,384. Plus reversion of land value at $80,000 in 20 years, 7% interest, factor .2584 (Appendix B, 7% Table, Column 4): $80,000 × .2584 = $20,672.

equivalent in a recapture rate, frankly considering it as an addition to the building interest risk rate rather than a precise prediction of how many years the building will produce income and be useful. Similarly, in selecting a suitable recapture rate, the appraiser may either base his addition to the interest rate on an estimated remaining economic life, or, alternately, he may consider this provision for recapture to be a rate surcharge to cover the probability of depreciation. In either case, the rate may be explained or rationalized in relation to an economic life estimate.

Thus there may be a distinction between remaining economic life and capital recapture period. In a strict sense, the former means the period over which the property earns interest on the land, plus a return attributable to the improvements. An individual investor, however, might be influenced to accept a shortened or extended recapture period, or to vary the acceptable amount of surcharge, because of political or economic factors, contemporary investment standards, or inflationary or deflationary trends which influence decisions.

Rate Selection by Band of Investment Theory

Another method of analysis or rationalization of the over-all rate of 9% indicated by the sale ($36,000 income/$400,000 sale price), in the example shown earlier in this chapter, is the use of bands of investment.

The interest rate developed by application of the band of investment theory is a synthesis of mortgage and equity interest rates which market data disclose as applicable to comparable properties. The rate developed is a weighted average, the weighting being for the respective portions of the value represented by the mortgage and equity positions, or bands of investment.

Assume that the currently available market interest rate is 7% for a 75% mortgage on the type of property being appraised, and equity investors are estimated to demand 9% interest return exclusive of provision for recapture. The resultant composite interest rate is thus derived:

	Portion of Value		*Interest Rate*		*Product*
First mortgage	.75	×	.07	=	.0525
Equity	.25	×	.09	=	.0225
Composite interest rate	1.00				.0750 or 7.5%

The above 7.5% interest rate includes no provisions for recapture of invested capital and is applicable to the net income from a property *after* provision for recapture. It may be applied to the estimated net income (after the provision for recapture) from a similar property being appraised to translate that income into a value estimate for the property.

The 1.5% differential between the 7.5% interest derived in the foregoing example and the 9% over-all rate reflected by the sale is imputable to recapture and/or any anticipated increase or decrease in the value of the total property during the mortgage term.

Another application of the band of investment theory involves the use of over-all rates for mortgage debt service and anticipated cash flow to equity. The mortgage requirement rate includes both interest and recapture (amortization) of the mortgage component of the total investment. The equity dividend rate pertains to the remainder of the net income, which is the anticipated cash flow to the equity investment. An analysis of the 9% over-all rate (reflected by the sale property) includes this equity return or "dividend" (both interest and amortization of principal) as follows:

	Portion of Value		*Rate*		*Product*
Over-all rate	1.00	×	.09000	=	.09000
Less mortgage debt service	0.75	×	.08484♦	=	.06363
Equity return	0.25	×	equity rate	=	.02637

So equity dividend rate $= \frac{.02637}{.25} = .10548^{\dagger}$ rounded to 10.5%.

♦ Annual mortgage payment, 7% per annum interest and complete amortization of mortgage in 25 years. The above annual rate, .08484, is based on monthly payments and is commonly referred to as the mortgage constant. Financial Publishing Co., *Monthly Payment Direct Reduction Loan Amortization Schedules* (12th ed. Boston: Author, 1970), p. 446.

† Explained at † on following page.

If the available mortgage terms are known, the debt service or mortgage constant can be determined; and if the cash flow rate required to attract equity capital is known or can be estimated, the over-all rate applicable in direct capitalization may be computed as follows:

	Portion of Value		*Rate*		*Product*
Mortgage debt service	0.75	×	.08484	=	.06363
Equity dividend	0.25	×	.10548	=	.02637
Over-all rate	1.00				.09000 or 9%

It will be noted that this over-all rate provides for recapture of 75% of the investment in 25 years plus a cash flow of 10.548% per annum on the equity investment. The eventual equity yield rate will be greater than 10.548% if the value of the property declines less than 75% in 25 years. If the property value declines more than 75% in 25 years, the equity yield rate will of course be less than 10.548%.

This adjustment or refinement of the percentage that the dividend bears to equity develops a yield rate on the equity investment; this provides for the reduction of mortgage principal and any anticipated increase or decrease in the value of the total property. This is developed in the chapter on Annuity Capitalization under the subheading Mortgage Equity Method of Capitalization.◊

† Anticipated cash flow (or dividend) to the equity after mortgage payments.

$$\frac{\$36{,}000 - \$25{,}452}{\$100{,}000 \text{ equity}} = .10548$$

This calculation is based on the following factual data:

Value	$400,000
Mortgage	300,000
Equity	$100,000

Mortgage debt service: $300,000 × .08484 = $25,452.
Net income before debt service: $36,000.

◊ For a simple explanation of the procedure of making such an adjustment, see Charles B. Akerson, M.A.I., *An Introduction to Mortgage-Equity Capitalization* (2d ed. Chicago: American Institute of Real Estate Appraisers, 1973).

Thus, the 9% over-all rate has been rationalized by means of the currently obtainable market debt service rate, with the residual net income imputed to an annual cash flow dividend (not interest yield) rate. The validity of this analysis, or any analysis, depends on whether the built-in assumptions of the method fit the time and amount factors inherent in the property being analyzed or appraised.

It should now be clear that different methods of capitalization, or of capitalization rate analysis, are inappropriate if varying values or rates result for a specific property. *If varying answers are so obtained for one particular property, it indicates that one or more of the methods applied include assumptions that do not fit the property.* This point will be the subject of further discussion in the subsequent chapters on capitalization.

Rate Selection by Direct Comparison

With sufficient data, closely comparable in respect to quality attributes, the appraiser may develop interest rates applicable in straight capitalization by direct comparison from market sales, estimating a reasonable recapture period, and deriving the rate as follows:

Net income before recapture		$36,000▲
Sale price	$400,000	
Land allocation (usually by comparison)	80,000	
Building component of purchase price	$320,000	
Estimated remaining life	40 years	
Indicated recapture rate	2.5%	
Less recapture ($320,000 × 2.5%)		—8,000
Interest on land and building		$28,000
Interest rate ($28,000 ÷ $400,000)		7%

Thus a combination of 7% interest and 2.5% recapture is developed from a market sale at a 9% over-all rate. The sum of interest and recapture rates exceeds the over-all rate because the

▲ First-year income. See following chapter for explanation of straight capitalization with straight-line recapture.

recapture rate applies only to the building component, in this case 80% of the total sale price. The appraiser may accumulate a sufficient number of open-market property sales to establish the contemporary rates acceptable to typical investors for various types of property.

When such data is available and research is carried on effectively, the high degree of judgment involved in developing capitalization rates is given factual support. Further, when the objective of the appraisal is a market value conclusion for the property being appraised, rate selection from the market is generally considered the best evidence of a capitalization rate.

It is frequently desirable to ascertain the current rate of return required to attract equity funds to investment in a specific type of property. Such rates may be extracted from reliable market data as follows:

Assume a property selling at $400,000, with the above allocation to land and improvements and the same $36,000 net income plus assumption by the purchaser of a $273,400 loan balance on an original 25-year, 7% mortgage with 20 years remaining. The building in this case is a well-maintained 5-year-old improvement, with an estimated straight-line annual recapture rate of 2.22% (45-year estimated remaining life). The interest rate of return to the $126,600 equity may be derived as follows:

Net income before recapture	$36,000
Less recapture estimate (2.22% × $320,000)	7,100
Interest return to total investment	$28,900
Less allocation to $273,400 mortgage balance @ 7%	19,140
Interest return to equity	$ 9,760

Equity interest rate applicable in straight capitalization $\frac{\$9,760}{\$126,600} = 7.7\%$

Either a lower sale price or refinancing of the mortgage at a lower interest rate would be required to increase this interest rate on the

equity investment. Conversely, a higher sale price or higher mortgage interest rate would lower the equity interest rate. This demonstrates *leverage* on real property investment. Leverage is the advantage accruing to the equity position through use of purchase capital available at an interest rate below the interest return available from, or applicable to, the property as a whole.

The straight-line building recapture provision (as developed in the preceding examples), used with straight capitalization, is only one of the procedures that rationalize *over-all* capitalization rates obtained in the market in terms of an interest and recapture rate. Other methods are discussed in subsequent chapters.

Rate Selection by Comparison of Quality Attributes

Having developed a probable range of applicable interest rates by direct comparison, the appraiser may consider selected requisites of a good investment as previously outlined in this chapter, and analyze the property in terms of these requisites.

The appraiser seeks to arrive at an opinion concerning the figure within this range applicable to the property being appraised. This may be accomplished by comparing the quality attributes of the property under appraisal with those of the sale properties previously analyzed. Among the attributes which he may consider are:

1. Reliability of the gross income prediction. How certain is it that the income will be forthcoming? Income is more dependable when the property is leased on a long-term basis to financially responsible tenants than when rented on a month-to-month basis to less reliable tenants.
2. Likelihood of competitive construction. Certain types of properties are subject to severe competition. If a property is located on a site adjacent to vacant land, there will probably be additional construction. This will result in competition which may tend to depress the net income from all of the properties, unless consumer demand correspondingly increases. But if the property is in a completely utilized, seasoned business location with strong demand, the possibility of competitive construction may be more remote.

3. Reliability of the expense prediction. Is there great danger of having expenses increased materially, or is there a fair chance that they will remain about the same, or even decrease?
4. Expense-income ratio. If the expenses are low in relation to gross income, the quality of the net income may be better, because a moderate reduction in gross income or a moderate increase in expenses does not affect the net income substantially.
5. Burden of management. Even when real estate management is employed, a property which requires constant attention, because of either maintenance or rent collection problems, is less desirable than one which needs minimal management. A long-term lease which requires a tenant to take care of all repairs and to pay taxes and insurance presents a situation relatively free from this burden of management.
6. Marketability of the property. An investment which has marketability and liquidity appeals to a wider group of investors than one lacking these attributes.
7. Stability of value. The value or market price of a piece of real property tends to remain within a narrower range for longer periods of time than do most other commodities, such as a carload of hogs or wheat. (Ideally, 1–7 would total 100%.)

Rating the quality of income is a useful procedure by which the appraiser may apply his judgment to the critical factors inherent in the property being appraised and in the comparable sales. Such an analysis also may be used in rating the net income from properties which have been sold, in an effort to obtain the probable interest rate applicable to the property being appraised. Consider four sales of comparable properties as follows:

Property	*Sale Price*	*Net Income after Recapture*	*Actual Interest Rate in %*
A	$450,000	$33,750	7.5
B	405,000	34,425	8.5
C	430,000	34,400	8.0
D	360,000	34,200	9.5

These properties are now put to the test of quality attributes, on the basis of 100% for an ideal property. Property A rated 90%; property B, 80%; property C, 85%; property D, 75%. To reflect relative quality, the actual interest rate is multiplied by the rating assigned:

Property	*Actual Rate (%)*	*Quality Rating (%)*	*Indicated Rate (%) for Ideal Income*
A	7.5	90	6.75
B	8.5	80	6.80
C	8.0	85	6.80
D	9.5	75	7.12

Within the above range the indicated rate for an ideal property selected might be 7%.△

The property being appraised is next rated on the basis of the same quality attributes. Assume the developed quality rating is 85%; then the applicable interest rate will be higher than 7%, and may be ascertained by dividing 7% by .85, thus developing for this property a rate of 8% plus.

There is no uniform interest rate applicable to all income streams. Each property justifies its own rate, depending upon its inherent elements of risk. Rates also may differ for similar properties in various sections of a city or in other parts of the country, and vary from time to time even for the same property.

It will be noted in the above analysis that quality attributes tend to overlap. The reliability of income and expense predictions may be covered in the income and expense analysis. Competitive construction and stability of value tend to overlap into the durability of income. The quality analysis by comparison of attributes helps the appraiser to consider and to justify his selected rates, basing his conclusions on sound reasoning.

Any selection of an interest rate by comparison recognizes the reaction of people in the market place. For instance, if it is found that a number of properties of essentially the same quality are selling for approximately $400,000 and have a net income of $36,000 before a reasonable provision for recapture, then it is readily understandable that the desired over-all rate of return for this type of property is 9%.

△ Selection is not necessarily a precise average but a figure (perhaps the nearest .25%) that in the judgment of the appraiser reflects a typical rate indicated by the analysis.

Rate Selection from Gross Rent Multiplier

In the absence of expense figures, it is possible to estimate the market interest rate from a gross capitalization rate, indicated by sales of comparative properties, or the reciprocal thereof, which is an annual gross rent multiplier.

Beginning with either figure, the net interest rate may be obtained by abstraction, provided reasonable estimates of long-term operating ratios, land-to-building ratios, and capital recapture periods for the comparable sales can be made. Here the operating ratio (ratio of all expenses to gross income) would be based on the gross rent schedule. If effective gross income is used, an appropriate adjustment is in order.

The following table demonstrates that the interest rates extracted by this procedure follow a pattern, even when the gross rent multiple, operating ratios, and land-to-building ratios differ.

EFFECT OF INCOME-OPERATING EXPENSE RATIO ON GROSS RENT MULTIPLIER

	Property		
	A	*B*	*C*
Sale price	$400,000	$480,000	$300,000
Gross income, annual	60,000	80,000	60,000
Operating ratio, % gross	40%	50%	60%
Capital recapture period (40 yrs.)	2.5%	2.5%	2.5%
Land ratio	20%	50%	60%
Building ratio	80%	50%	40%
Gross rent multiple			
Sale price/Gross income	6.66	6	5
Gross capitalization rate	15%	16.66%	20%
All expenses as percent* of Sale price	6%	8.33%	12%
Over-all capitalization rate	9%	8.33%	8%
Straight-line recapture provision, 2.5% times Building ratio	2%	1.25%	1%
Resulting interest return on investment	7%	7.08%	7%

* 40% of 15%; 50% of 16.66%; 60% of 20%.

In any capitalization approach, sufficient sales should be analyzed to obtain a reliable bracket for a derived rate. Sales of properties considered comparable should be those that reflect net income characteristics reasonably similar to those pertaining to the property being appraised. These characteristics should be consistent with the assumptions made for the appraised property as to income and recapture patterns, and extracted capitalization rates are then applicable to the appraised property within the framework of a capitalization method appropriate to these assumptions.

Split Rates

This term refers to the application of different interest rates to land and to improvements, and is not to be confused with the application of a capitalization rate for improvements, which differs only because of the addition to the interest rate of a recapture component. The use of split rates was defended at one time on the basis that improvements are subject to more hazards than is land. It is now generally accepted that the land and the improvements are wedded in a single use which presumably will endure well into the future, and since the resultant whole property is bought and sold in the market place as a single entity, it is generally not significant to ascribe different risk rates to the two components. The loading or recapture rate applied only to the improvements may therefore provide the means of adjustment for any estimated risk differential.

Where a property involves two or more separate estates, such as a leased fee and one or more leasehold positions, the separate interests may properly be capitalized at different interest rates to reflect the different risks inherent in the separate ownership estates. These estates constitute separate marketable entities. It is also proper to capitalize excess income which constitutes a lease benefit, an intangible property concept, at a rate reflecting the greater risk inherent in the excess income stream. In situations such as these,

appropriate interest rates may differ, but their use is not considered in the category of split rates as defined above.

Summary

Interest and capitalization rates are fundamentally influenced by the quantity, quality, and duration or timing of prospective income and reversionary gain or loss. The first is the amount to be capitalized, which is the net before deduction for recapture. The second, relative dependability of the income, is its quality. The third consideration involves the estimated period during which it is anticipated that the income will continue.

Interest rates can be derived by the band of investment theory, direct comparison (the extraction from market sales), and the comparison of quality attributes, as well as from gross income multipliers.

The appraiser researches comparable sales, for market evidence of rates appropriate to the property being appraised. He notes gross income multipliers, or over-all rates (net income before recapture divided by sale price) which he may allocate, on the basis of facts and judgment, into an interest rate and recapture rate acceptable to typical purchasers in the market. The interest rates demonstrated by these sale properties may be analyzed for all categories of risk; and from such analysis a rate may be derived for the subject property, reflecting its relative attractiveness as an investment.

In relation to capitalization rates and theory, rates necessary to attract investment capital to any specific type of real property are indicated by the collective action of contemporary investors in the market place. Their individual philosophies concerning return and recapture may vary widely, but if their collective action creates a discernible pattern in the market, the appraiser may identify and interpret this pattern in terms of rates applicable according to an appropriate capitalization method. Using this same capitalization method, the rates may then be applied to the property being appraised.

It is now generally accepted that land and improvements are wedded in a single use and usually share the same interest rate. However, for a property involving two or more separate estates, these may properly be capitalized at different interest rates to reflect the different risks inherent in the separate ownership estates.

CHAPTER TWENTY

Direct and Straight Capitalization

Capitalization is a procedure in the appraisal process by which the value of a property can be estimated from the quantity, quality, and durability (probable duration) of its net income expectancy. To convert net income estimates into an indication of value, an understanding of the different capitalization methods and techniques is essential.

In the preceding chapter, the theory of selecting interest and capitalization rates was explained. This chapter deals with the basic principles and assumptions inherent in the direct and straight capitalization methods and the residual techniques which may be applied to prŏjected incomes.

Basic Principles of Capitalization

There are two basic principles of capitalization of net income. The first, capitalization in perpetuity, assumes no variation of rate and no termination of income or of investment return, and is applicable, for example, to net rental produced by land. The other assumes a finite life to a wasting improvement. In the first case, the rate of earnings is perpetual because land is theoretically imperishable. It is generally assumed that when the present building is worn out, a new building or use will perpetuate income or amenities to the land in whatever amount is needed to support its value at that time. In the second case, building income will terminate at the end of the building's economic life; therefore *return of,* as well as *return on,* the building investment must be provided.

Capitalization of income under the first principle is a simple matter of translating income into value by dividing the net income by the interest rate. Under the second principle, when capital recapture is necessary, capitalization may involve an additional step which provides not only for interest on, but also return of, the investment.

Several methods for capitalizing the net income into an indication of value through the income approach are presented in this and the following chapter.

Direct Capitalization

This is the simplest method, being capitalization at the over-all rate. The appraiser examines the market, researches and analyzes sale prices of comparable properties, and estimates the net income, before recapture, for each sale property. From this data he develops a range of over-all rates, using the formula:

$$\frac{\text{Net Income}}{\text{Price}} = \text{Over-all Rate}$$

From the pattern of rates so developed, a rate is selected that is considered applicable to the property being appraised. This rate is then applied to the net income projection to arrive at a value estimate as follows:

$$\frac{\text{Net Income}}{\text{Over-all Rate}} = \text{Value Estimate}$$

This direct method of capitalization is based on market evidence and is the easiest to explain and to understand. It is also the first step in extracting interest and recapture rates on a comparative basis from the market.

The percentage of property value represented by land plays an important part in analyzing capitalization rates. To review the example in the preceding chapter, a property with a net income before recapture of $36,000 per year sold for $400,000, of which $80,000 was imputable to land and $320,000 to building. The in-

terest rate was 7%, and the demonstrated recapture rate was 2.5% per year. Contrast this with a property of the same quality and same durability of income, where the land is worth $200,000 and the building $200,000 (Property B), as shown in the following:

	Property	
	A	*B*
Sale price	$400,000	$400,000
Less land value (by comparison)	80,000	200,000
Land value ratio	20%	50%
Balance to building value	$320,000	$200,000
Building recapture 40 yrs. @ 2.5%/year	8,000	5,000
Interest on land and building value @ 7%	28,000	28,000
Total net income required to meet the above conditions	$ 36,000	$ 33,000
Over-all capitalization rate reflected by this net income projection and the sale price	9%	8.25%

Imputing the same quality and durability to each income stream, and assuming the consistent 7% interest rate and $400,000 sale price, the property with half the value in land (B) sold on an 8.25% over-all rate, whereas the original example, with one-fifth in land (A), sold on a 9% over-all rate. This illustrates that despite the same sale price and interest rate, a difference in the ratio of land to building may result in different over-all capitalization rates, and reflect a different net income.

In contrast, if the sales are at the same over-all rate, then the interest rates differ. For example, if each property involved the same $36,000 net income projection, analysis will disclose that Property B, with $200,000 in land value, sold on a basis of a 7.75% interest rate, instead of the 7% of Property A.*

It may also be demonstrated that wide variations in age or in operating expense ratios may cause changes in the relationship between the interest rate of return and the over-all rate. For these

* $36,000 income minus $5,000 recapture equals $31,000, and divided by $400,000 investment equals 7.75%.

reasons, the direct capitalization method should be used only when the over-all rate can be derived from sales which are similar in investor motivation and financing, and when the properties are reasonably comparable in age, operating expense ratio, and land-to-building ratio.

When these conditions are met, direct capitalization is applicable. Since it is easily explained and understood, it can be a convincing method of capitalization.

Investor's Approach to Capitalization

Through sales and purchases, investors in real estate establish the market value of property and thereby interest and recapture rates. As noted earlier, these actions create a significant pattern in the market.

There are many rules of thumb used by investors. Consider the case of the investor who purchased a property in anticipation of an 8% to 8.5% cash-flow dividend on his equity in the investment. Again it will be assumed that annual net income, before recapture, was $36,000 and the purchase price was $400,000, reflecting an over-all capitalization rate of 9%.

The computations on which his reasoning was based may have been thus:

Available for equity	$120,000	
Borrowing capability	280,000	
Available mortgage terms are 25 years at 8% which requires a constant annual cost for interest on and amortization of (factor, .09264)†		$25,940
Available cash flow (dividend) to the equity at an anticipated rate of 8.38%‡		10,060
Total net income available to satisfy investor requirements		$36,000

† Annual mortgage constant based on 25-year, 8% monthly payment loan, .00772 × 12 = .09264 annual constant. Financial Publishing Company, *Monthly Payment Direct Reduction Loan Amortization Schedules* (12th ed., Boston: Author, 1970), p. 646. Another source is Appendix B, 8% table (monthly), Column 6, monthly installment to amortize one is .007718.

‡ Cash flow of $10,060 divided by equity of $120,000 = .0838. On this basis the actual dividend rate expectancy is 8.38%.

In the above example, the investor receives an annual dividend consisting of the cash flow after payment of mortgage debt service. Some investors plan an investment holding period of not to exceed ten years. In the above example such an investor would have the benefit of the dividend or cash flow for 10 years plus the proceeds of a resale of the property at the end of the period as follows:

Investment (initial capital structure)	
Mortgage	$280,000
Equity	120,000
Total capital investment	$400,000
Mortgage balance in 10 years $280,000 × .80729[§]	$226,043
Equity investment (unchanged)	120,000
Total unamortized investment in 10 years	$346,043

§ Principal balance, 8% monthly payment loan, Financial Publishing Company, *Monthly Payment Direct Reduction Loan Amortization Schedules* (12th ed., Boston: Author, 1970), p. 646.

Any amount for which the property could be sold after 10 years that is less than, or in excess of, $346,043 would represent, respectively, a decrease or increase in the equity yield to the investor from the 8.38% level. This is more fully explored in the following chapter.

Straight-Line Recapture

Eventually, unless all costs have been recovered through the stream of income dollars, the enterprise will be dissipated. For this reason it is an accounting principle to recognize that buildings which are employed in the production of income do not have infinite lives, and some attempt must be made to recover their cost. The traditional solution has been to account for expiration of a fraction of historical cost with each passing year. The current year's revenues are charged with a presumed depreciation of cost. Logically, the amount of such cost amortization each year should follow some prearranged consistent pattern, rather than vary the cost flow to achieve a manipulated profit.

From an accounting point of view, when the building cost is

incurred, management is forced to declare a plan of cost recovery. The practice is to make an estimate of the number of years that the building will serve. Each future year during that estimate of life will bear a predetermined fraction of cost which, in combination with other expenses, will be deducted from that year's revenue. It is generally assumed that land has an infinite life and is not destroyed or consumed. Accordingly, it is not usual practice to "recover" its cost periodically.

Although depreciation accounting is not a valuation process but, rather, a process of historical cost allocation, the appraiser recognizes certain conventional accounting concepts. He has observed that as buildings grow older and deteriorate physically and functionally, the typical investor requires some addition to his interest rate to cover the risk of probable or possible loss due to depreciation of the building portion of his investment. However, while this has a relation to an anticipated future life of the building or other improvement, the assumed decline may or may not occur. It is frequently offset by fluctuations in land value, construction costs, and economic changes. The actual future depreciation ultimately realized may be, and frequently proves to be, entirely different from that currently acceptable by investors as part of the over-all market capitalization rate.

It has also been noted that inappropriate applications of different methods of capitalization to a specific property produces unwarranted indications of value. Use of more than one method may reflect an error in judgment and lead to the application of a method which incorporates built-in assumptions in conflict with the facts and probabilities inherent in the property being appraised.

Accordingly, in studying the examples in this and the succeeding chapter, the reader should carefully note the basic assumptions in each method. In this chapter, straight capitalization with straight-line recapture is demonstrated. Inherent in this method is the assumption of a declining net income imputable to the improvement for the recapture period.

The following is a simple example of straight-line recapture based on remaining economic life concepts:

Estimated remaining economic life	25 years	30 years	40 years	50 years
Annual depreciation rate	4%	3.33%	2.5%	2%

In the application of the straight capitalization method in the income approach to a value estimate, these annual depreciation rates are added to the interest rate, to arrive at the capitalization rate applicable to the net income imputable to the building. In the following tabulation the building is assumed to represent 80% of total value, and the land, 20%.

	%	%	%	%
Annual recapture rate	4.0	3.3	2.5	2.0
Building interest rate	7.0	7.0	7.0	7.0
Building capitalization rate	11.0	10.3	9.5	9.0
Building component of over-all rate (Building 80% of total value)	8.8	8.2	7.6	7.2
Land component of over-all rate (Land 20% of total value at 7% land risk rate)	1.4	1.4	1.4	1.4
Over-all Rate	10.2	9.6	9.0	8.6

These computations demonstrate that the over-all rate is affected by changes in the recapture rate applicable to the improvements.

The straight capitalization method with straight-line recapture may be applied to the net income from most properties when it is understood that this method implies a future annual decline in net income. This annual decline equals the return on the annual provision for recapture, as demonstrated later in this chapter.

Straight Capitalization with Straight-Line Recapture

The assumptions implicit in straight capitalization with straight-line recapture are:

1. That portion of income imputable to land remains constant (level to perpetuity), and that imputable to improvements de-

clines in a fixed annual amount due to reduction of the investment through annual recapture.
2. Recapture is a constant annual amount over the remaining economic life of the improvements.
3. Interest is received each year on the amount of investment remaining after recapture and hence follows a straight-line declining pattern.

To illustrate, again assume a land value of $80,000, a building value of $320,000, a remaining useful building life estimate of 40 years, a 40-year income stream starting at $36,000 the first year, and an interest rate of 7%.

Judgment factors essential to the validity of the arithmetic of straight capitalization with straight-line recapture are that the market value of this improvement will decline 2.5% of $320,000, or $8,000 each year for 40 years, and that $8,000 will be extracted from income each year to recapture this prospective loss in value. Because each $8,000 extraction will reduce the capital investment by that amount, the interest requirement will decline 7% of $8,000, or $560 annually. Thus the building interest component of the income stream will be $22,400 the first year and will decline $560 each year thereafter to the end of the 40th year, as shown in the following tabulation:

Land value	$ 80,000 × 7%	$ 5,600
Building value	320,000 × 7%	22,400
Depreciation recapture	320,000 × 2.5%	8,000
Total first-year net income		$36,000

Analysis of Declining Income Stream*

Year	*Building Value*	*Land Value*	*Return of Building*	*Return on*		*Total Income*
				Building	*Land*	
0	$320,000	$80,000				
1	312,000	80,000	$8,000	$22,400	$5,600	$36,000
2	304,000	80,000	8,000	21,840	5,600	35,440
3	296,000	80,000	8,000	21,280	5,600	34,880
4	288,000	80,000	8,000	20,720	5,600	34,320
5	280,000	80,000	8,000	20,160	5,600	33,760

(continued)

ANALYSIS OF DECLINING INCOME STREAM* (continued)

Year	Building Value	Land Value	Return of Building	Return on Building	Return on Land	Total Income
		6th through 35th year omitted				
36	32,000	80,000	8,000	2,800	5,600	16,400
37	24,000	80,000	8,000	2,240	5,600	15,840
38	16,000	80,000	8,000	1,680	5,600	15,280
39	8,000	80,000	8,000	1,120	5,600	14,720
40	0	80,000	8,000	560	5,600	14,160
	Total recaptured		$320,000			
	Remaining value		$ 80,000 (Land)			

* With end of year payments. Assumptions: Land value $80,000; Building value $320,000; Building life 40 years; Risk rate 7%.

This automatic assumption that income declines $560 per year is equivalent to saying that from its $30,400-per-year starting point, the total net income imputable to the building drops 1.842% per year.♦ The rate of decline varies with different combinations of interest and recapture rates. Using i as the interest rate and d as the recapture rate, the formula for computing the rate of decline in the net income imputable to building investment is:

$$\frac{i \times d}{i + d} = \text{rate of decline}$$

As applied to the above example, the computation is:

$$\frac{.07 \times .025}{.07 + .025} = \frac{.00175}{.095} = .01842 \text{ or } 1.842\%$$

Accordingly, in the above application of the straight capitalization method, the appraiser has assumed that the net income imputable to the building will decline at a rate of 1.842% per year.

To apply the straight-line recapture procedure correctly, the appraiser should believe that the net income may be expected to decline as the building gets older (frequently typical of aging multi-occupancy real estate), and/or that the typical investor will require, on the investment imputable to the building, a return in

♦ $22,400 return on building plus $8,000 depreciation recapture equals $30,400. $560 ÷ $30,400 = 1.842%.

excess of the interest rate to compensate for an anticipated future depreciation. In other words, the building should be of a type which may be expected to suffer future depreciation as assumed in the calculation, and a prudent investor would therefore expect an addition to the risk rate to compensate for this anticipated future loss in building value.

Straight Capitalization with Sinking-Fund Recapture

Straight capitalization is generally applied in appraisal practice with straight-line recapture, the pattern of which has been illustrated and explained. However, it may also be applied in combination with a sinking-fund recapture provision. When so applied, the procedure corresponds to use of the Hoskold annuity factor, as explained in the following chapter.

The Residual Techniques

The valuation of an income-producing property involves processing of its projected net income potential by the applicable method of capitalization, in combination with the appropriate residual technique, whereby income is capitalized to indicate a property value estimate. There are three such techniques: land residual, building residual, and property residual. All of them may be used in straight capitalization with straight-line recapture or with sinking-fund recapture or with annuity capitalization, as demonstrated in this and in the following chapter.

The term residual is used to indicate that in the last steps of these techniques, the portion of the net income to be capitalized consists only of the remainder or residual portion attributable to return on the land value, the building value, or both, as follows:

In the land residual technique, the building is valued separately, and the fair annual net return on the building value (interest and provision for recapture) is deducted from the estimated net attributable to the whole property. The residual amount is attributable to the land, and is capitalized at an interest rate commensurate with the risk, to arrive at an estimate of the land value.

The value assigned to the building, if a new and proper structure, is the recently completed cost, provided this cost is considered proper, typical, and all inclusive. If relatively new, it may be the depreciated cost as of the date of the appraisal. This estimate is subject to serious error if applied to older buildings because of the difficulty involved in estimating the extent of accrued depreciation. The older the building, the greater the possible error. It may be preferable to estimate the construction cost of, and the potential net rental income from, a hypothetical new and proper structure as the basis upon which to estimate a residual allocation of net income that will reasonably reflect the value of the land.

In the building residual technique, the land is valued separately, and the fair annual net return on the land value (interest) is deducted from the estimated net income before recapture attributable to the whole property. The residual amount is attributable to the building's interest and recapture, and is capitalized at the building capitalization rate to indicate the building value. The value assigned to the land may be based upon recent sales of similar but vacant lots, or computed by the land residual technique, assuming a hypothetical new and proper structure. This building residual technique was employed in illustrating straight-line recapture.

The property residual technique utilizes a similar procedure in straight capitalization or alternately, direct capitalization may be substituted, as illustrated later in this chapter.

These residual techniques are in fact mathematical procedures which enable the appraiser to use certain known factors to find an unknown. In the land residual technique, the known or assumed factors are net income before recapture, building value, interest rate, and the remaining useful life of the building. The unknown or residual factor is the land value. In the building residual technique, the known or assumed factors are net income before recapture, land value, interest rate, and the remaining useful life of the building. The unknown factor is the building value.

The general purpose of the residual techniques is to estimate

the value of a property when the land or building value is unknown or cannot be estimated separately on a reasonable and convincing basis. Two of these techniques serve to estimate what portion of the property value is attributable to the buildings or to the land. The third provides an estimate of the property value as a unit without separate allocation to land and buildings.

Application of Techniques

Mathematics is a valuable tool in the appraisal process. However, no one has ever been able to devise an automatic, mechanical procedure for measuring the likes and dislikes of people or the extent of human emotions. What people do depends on the many influences, conscious and subconscious, to which they are exposed. The various mathematical processes for capitalizing income help the appraiser to translate reactions of people into terms of value reactions as evidenced by the market. Appraising is an observational process. Observation indicates that people tend to act rationally. Under comparable conditions their reaction and thinking tend to follow predictable patterns. Just as a good job of carpentry requires efficient tools, as well as judgment and experience, so also sound appraising requires effective tools to apply judgment and experience. In appraising, the mathematical methods and techniques serve as aids. In the final analysis, the validity of the answer depends upon both the appraiser's judgment and his skill of interpretation. Effective use of the residual techniques assists in the development of valid conclusions, and provides rational support for their presentation.

Following are examples of the building, land, and property residual techniques. Each is illustrated, using straight capitalization with straight-line recapture. The property residual technique is also demonstrated by direct capitalization.

When applied to the same net income figure, different methods of capitalization produce different answers because they include different inherent assumptions as to recapture, income pattern,

and interest. However, use of different residual techniques within one capitalization method should produce the same value estimate. It is therefore apparent that the only reason for preferring one of these residual techniques to another is to enable the appraiser to predicate his appraisal process on those assumptions which he can best support.

Building Residual Technique

In the application of the building residual technique, the land value first must be estimated from sales of comparable parcels, offers, asking prices, or from the capitalized value under a hypothetically proper improvement. The building value is then computed by capitalizing the net income after deducting interest on the land value. The computations in obtaining an indication of value by straight capitalization, using straight-line recapture, follow:

BUILDING RESIDUAL TECHNIQUE
Straight Capitalization Method—Straight-Line Recapture

Estimated land value	$ 80,000
Net annual income projection (before recapture)*	$ 36,000
Less return to land, $80,000 at 7%	—5,600
Net income imputable to building	$ 30,400
Estimated annual depreciation or recapture rate, based on a 40-year remaining economic life estimate, 1/40 = .025	
Capitalization rate for building income Interest rate (.07) plus (recapture) rate (.025) = .095	
Building valuation: $30,400/.095	$320,000
Land value	80,000
Indicated property value estimate	$400,000

* First year.

Thus in the building residual technique the value of the building is predicated upon the quantity of its contribution to the net income, rather than upon the appraiser's estimate of its currently depreciated reproduction cost. This technique is particularly ap-

plicable where substantial accrued depreciation exists, perhaps including economic and functional obsolescence, the extent of which is difficult to estimate in the cost approach. This technique is also appropriate when the property being appraised includes improvements which are in late life, and consequently involve extensive accrued depreciation, or are unsuitable for the site.

Beginning with the $400,000 sale under the circumstances of the above example, the interest (risk) rate reflected by the sale may be extracted as follows:

Annual net income before recapture	$36,000
Recapture (based upon a 40-year remaining life estimate) 2.5% × ($400,000–$80,000), or 2.5% × $320,000	—8,000
Net income after provision for recapture	$28,000

Interest rate $\frac{\$\ 28{,}000}{\$400{,}000} = 7\%$

Such computations, based on market research (as noted in the previous chapter on Interest and Capitalization Rates), provide the appraiser with supporting documentation for the 7% interest rate as used in the example above.

Land Residual Technique

In the land residual technique, the positions of land and building are reversed. A fixed value is assigned to the building, and the anticipated annual net return on the building value (interest and provision for recapture) is deducted from the estimated net income before recapture produced by the entire property.

The residual earnings are considered attributable to the land and are capitalized to indicate the land value. The value assigned to the building is customarily based upon an estimate of its current cost new, less any existing accrued depreciation, which should generally be minimal to validate this technique.

The building should also represent the highest and best use of the land, and the value of either the existing building or a hypothetical building is assumed equal to its present reproduction

cost including all carrying charges and profits. Computations involved in the applications of this technique are demonstrated as follows:

LAND RESIDUAL TECHNIQUE
Straight Capitalization Method—Straight-Line Recapture

Estimated building value		$320,000
Estimated annual net income before recapture*		36,000
Interest and recapture on building value		
Interest	7%	
Recapture (40-year life estimate)	2.5%	
Total	9.5%	
$320,000 × 9.5%		—30,400
Net income imputable to the land		$ 5,600
Interest rate: 7%		
Land value ($5,600/7%)		$ 80,000
Building value		320,000
Indicated property value estimate		$400,000

* First year.

This land residual technique must be used with care because misapplication can seriously distort the land value estimate. The residual income after interest on, and recapture of, building value may include income which is imputable to components other than the land. These include such items as developer's profit or excess income resulting from an advantageous lease. A portion of the residual income, after interest and recapture of the building value, is imputable to a fair rate of return on the land. The balance may be attributable to the entrepreneurial contribution.

As explained in the chapter on Basic Principles of Property Value, four agents are involved in the production of income: labor, capital, coordination (entrepreneur), and the land. All four agents are essential to the production of gross income. The land provides location and support. The structure furnishes the rentable space. The entrepreneur coordinates land and improvements into an income-producing property. Labor and utilities are

necessary to build and operate the property. However, these four productive agents do not enjoy the same degree of preference in the distribution of the gross income. Labor (the salaries and wages of those rendering personal services) must be paid first. Capital must be considered next. This includes the interest on, and the eventual return of, the capital invested in the improvements. Third is the cost of organization and promotion. Finally, the residue of the gross income, constituting the earnings of the land, is then capitalized to reflect the value of the land.

Because in economic theory, land's share of the gross income is considered residual, some people maintain that land should always be made residual in the capitalization process. This belief is not valid. The use of the land residual technique may or may not be advisable, depending upon the age and the character of the improvement and its suitability to the site. The appraisal of many improved properties by the land residual technique would result in a residual land value of less than the value of the land if it were vacant. This situation exists where the structure is not considered a proper improvement of the site.

In practice, many buildings which at one time might have been the proper improvement (the highest and best use) of the land, become over- or under-improvements with the passage of time. Since use of the land residual technique in such cases produces a distorted land value, use of the building residual technique is indicated. This recognizes land value on the basis of its highest and best use, and the resulting residual building value estimate will reflect any loss in value due to the unsuitable improvement or to accrued depreciation.

Application of the previously demonstrated building residual technique may be used to illustrate this situation. Assume that a new building may be erected at a cost of $280,000 on a vacant site purchased at its market value of $120,000; that the net income projection is $32,400 per year; that 3% represents a reasonable addition to the capitalization rate on the building, as a provision for recapture of the investment in the building; also that market

research indicates 7% as an appropriate interest rate selection. Accordingly:

Investment cost	
Land	$120,000
Building	280,000
Total	$400,000
Annual net income*	$ 32,400
Return to $120,000 land value @ 7%	—8,400
Return to building	$ 24,000
Capitalized at 10% (7% interest + 3% recapture) indicates a building value of	$240,000
Add land	120,000
Indicated economic value of property	$360,000

* First year.

This example illustrates, through application of the building residual technique to a new property, that this building would not be the highest and best use of this site; and the $400,000 investment cost, minus the $360,000 economic value of the property, reflects a loss in value of $40,000. As indicated above, the use of this technique will reflect loss in value owing in this case to an unsuitable improvement.

Property Residual Technique

Direct capitalization is sometimes substituted for the property residual technique of straight capitalization. This is illustrated as follows:

PROPERTY RESIDUAL TECHNIQUE

Using Direct Capitalization

Annual net income*	$32,400
Capitalize at the over-all capitalization rate which is derived from sales of comparable properties. Assume this rate to be 9%.	

$$\text{Indicated property value} = \frac{\$32,400}{.09} = \$360,000$$

* First year.

The over-all capitalization rate reflects a combination of the interest (risk) rate, and the building recapture rate. The proportion of the land value to the total value tends to vary the over-all rate.

In the standard application of the Property Residual Technique, the estimated depreciation on the improvements is deducted from net income before recapture. The remainder is capitalized at an appropriate interest rate to arrive at a property value.

PROPERTY RESIDUAL TECHNIQUE
Straight Capitalization Method—Straight-line Recapture

Capitalization of Net Income after Provision for Recapture

Estimated building value	$320,000
Estimated annual net income before recapture	$ 36,000
Less recapture on building value $320,000 @ 2.5% (40-year life estimate)	—8,000
Annual net income imputable to the property (land and building)	$ 28,000
Property value ($28,000 capitalized at 7%)	$400,000

This technique* is useful and acceptable when the estimated value of the improvements to be depreciated can be substantiated. Otherwise capitalization of net income imputable to the building at a rate equaling interest and provision for recapture of building investment under the building residual technique may be preferable. (See Building Residual Technique above.)

Contract, Economic, and Percentage Rents

Straight capitalization is normally applied with a net income projection based upon an economic rent level. In appraisal practice, contract rents are frequently encountered which deviate from estimated economic rent. Percentage rentals are also commonly encountered in the appraisal of retail properties. Since a property

* Another variation of the Property Residual Technique is presented in the following chapter on Annuity Capitalization.

must generally be sold in the market subject to the provisions of an existing lease or rental contract, the appraiser is obliged to consider the resulting effect of these leases, if any, on the market value of the property appraised free of lease.

The contract rent may be in excess of economic rent or it may be less than that level. If the discrepancy is minimal, it may not exceed the margin of error involved in the estimation of the economic rental level, and hence the contract rent may be considered to represent economic rent. Alternately, the appraiser may choose to adjust his vacancy allowance slightly to reflect the probable effect of a small differential.

On the other hand, a substantial excess or deficiency, in relation to the economic level, is recognized by the appraiser for the remaining life of the lease or leases creating it, and may be capitalized (discounted) to a present worth. This figure represents an addition or a deduction from a value estimate based upon economic rent.

Where contract rent is less than economic rent, it is reasonable to expect that a tenant will take advantage of his favorable position to lease maturity. In reducing the income difference to a present-worth figure, the discounting rate usually coincides with that used in processing the economic rental into a value estimate. Theoretically, a higher risk rate is appropriate since the dollars involved represent the top portion of the total income. This is a matter of appraisal judgment in a specific case, but since the lower contract income level represents a lower risk than the higher economic income level, the resultant adjustment as above reflects a practical balance.

Where contract rent exceeds economic rent, the dependability of the excess income must be considered. The credit of the lessee is an important factor. In the absence of top credit, or other assurance that the excess income stream will continue to lease expiration, the risk inherent in this excess income will be higher than for economic rent. The extent of this increase in risk (as

estimated by the appraiser in the light of his market research) is reflected in a higher capitalization or discount rate for this excess income. The value increment resulting from an excess rental may be referred to as a lease benefit.

Percentage rental represents a special category of income, not fixed but sensitive to changes in business volume, whether these are due to general economic conditions, varying levels of competition, or other factors. Inherently less dependable than a fixed rental, the appraiser's percentage income projection is normally discounted to a present-worth figure at a rate reflecting his estimate of the increased risk. In situations where the guaranteed contract rental is very low or where there is no fixed rental stipulated in the lease, all or part of percentage rent may be included in the estimate of economic rent and may be treated as such.

Where percentage leases are encountered, it is possible that the total net income projection may involve three components with three levels of risk. A guaranteed minimum fixed rental is normally below the economic rental level and represents a well-secured contract rental with minimum risk. The percentage income up to the economic rent level involves a little more risk because the tenant is entitled to continue his occupancy even if, for some reason, he ceases to pay any percentage. Estimated percentage rental in excess of economic rent represents an even more vulnerable income stream, the level of which may fall rapidly with any decline in business volume (e.g., if percentage rental is being paid on the top 20% of business volume, a 10% decline in volume will result in a 50% decline in percentage rental).

In the appraisal of income-producing real estate the appraiser analyzes the income stream, considers its possible components, and reflects his conclusion of the relative risks involved in his selection of applicable interest rate, or rates. A property under lease is generally bought or sold in the market subject to that lease, and the market value may be increased or reduced as a result of favorable or unfavorable lease terms.

Summary

Direct capitalization and straight capitalization using straight-line or sinking-fund recapture are methods that may be applied to the net income of properties in the income approach to value. (The sinking fund recapture concept as well as its use are illustrated in the next chapter with the presentation of the Hoskold coefficient.) These methods may be used either in processing net income into indicated value estimates or in extracting interest rates and recapture rates from sales of similar properties. The over-all rate may be rationalized on the basis of a division into interest rate on land and building, and an additional rate to make provision for depreciation of the investment imputable to the building. It may also be explained by using the investor's approach to capitalization; that is, the sum of the mortgage constant (rate) currently available in the market, plus a rate of dividend or cash flow on the equity investment.

Straight capitalization, using a recapture rate to provide for anticipated depreciation, may be applied by use of the following residual techniques:

Building residual technique. This technique involves an allocation of net income to the land. The remainder is considered attributable to return on, and recapture of, the building investment, and is capitalized into an indicated value of the building. In most cases where land value can be adequately estimated by comparison or other means, the building residual technique is used. The value estimate produced by this technique reflects any under- or over-improvement of the site.

Land residual technique. This technique reverses this procedure. The net income is allocated first to the building, providing a return on, and recapture of, the estimated building value. The remainder is considered attributable to the land, and is capitalized into an indicated land value. The land residual technique is used when land value cannot be supported adequately by other means, or when it needs checking for reasonableness. It is generally most reliable when building value is known, usually when the building

is new—or nearly so—and represents the highest and best use. In conjunction with a hypothetical structure, the technique may be a basis for indicating land value.

In applying this technique, the residual income to the land may, in fact, be imputable not only to the land, but also to entrepreneurial increment or developer's profit. Care must be taken that the portion of the net income assigned to these items is not capitalized into an indication of added residual land value.

Property residual technique. By this technique the net income after recapture of building investment is capitalized at the interest (risk) rate. This technique is applicable when the value of the improvements is nominal in relation to land value or when the improvement value estimate is reliable. Alternately, direct capitalization may be used in lieu of the property residual technique in straight capitalization. This technique can be checked in the market. From his judgment and experience, the appraiser may break the over-all rate into components of interest risk and recapture of building investment without departing from the over-all rate.

Investors' approach to capitalization. This is a combination of the available mortgage debt service rate currently available in the market with the equity cash flow or dividend rate currently acceptable to typical investors. This method is analyzed further in the following chapter, which is pertinent also to the selection of appropriate methods and techniques.

Except where leases support contract rent for the period of projection, capitalization is usually based upon economic rent. Where contract rent indicates a future income expectancy deviating from an economic rental level, the anticipated contract rental level is recognized for the period of the lease creating it.

Straight capitalization is normally applied with a net income projection based upon an economic rent level. Since a property must generally be sold in the market subject to the provisions of an existing lease or rental contract, the appraiser is obliged to consider the effect of the leases, if any, on the market value of the property.

CHAPTER TWENTY-ONE

Annuity Capitalization

THE PRECEDING CHAPTER presented straight or direct capitalization, which may be referred to as a method of capitalization without interest tables, whereas annuity capitalization is a method which makes use of compound interest tables.

Construction of Basic Interest Tables

Problems involving capital investment for profit in the form of periodic interest or yield generally belong to one of two broad classes:

1. The future worth of money at interest: the amount to which money will grow in a given length of time when invested or deposited at a given rate of interest.
2. The present value of future collections: the present value of money to be collected at a specific future time when discounted from that time to the present date at a given rate of interest.

In each case, the amount involved may be a single lump sum or a series of periodic installments, such as rent. Often it is a combination of both. Each of these two general categories entails three types of problems. Hence, there are six basic formulae for problem solution, as shown in the following pages.

Because direct application of the formulae to each problem would consume a great deal of time, the formulae are employed for the compilation of standard tables. Each table presents one of six precomputed functions of one dollar, or any other unit, at selected rates of interest for various periods of time. In other words, a single unit, or a series of one unit installments, is assumed for calculation of each tabulated function. When the desired function

for one unit is known, it can be applied to any number of units by multiplication. Thus, comprehensive compound interest tables present six standard functions of one dollar or other unit.

The *effective interest rate* is the annual or nominal rate divided by the number of conversion periods or installments per year. The user therefore is cautioned to select the appropriate conversion frequency (monthly, quarterly or annually). The compound interest tables presented in Appendix B, for nominal interest rates from 3% to 30%, are given only on the basis of annual collections or conversions; but in the 8% table, monthly, quarterly, and semi-annual factors are also presented.

The tables for the selected interest rates (Appendix B) have six columns showing the factors for the six standard functions of one dollar, or any other unit, with the formula and standard actuarial symbol for each:

1*

AMOUNT OF ONE

$$S^n = (1 + i)^n$$

The amount to which an investment or deposit of one dollar will grow in a given number of time periods including the accumulation of interest at the effective rate per period. This factor is commonly known as the *Future Worth of One Dollar with Interest.*

2*

AMOUNT of ONE PER PERIOD

$$S_{\overline{n}|} = \frac{S^n - 1}{i}$$

The total accumulation of principal and interest of a series of deposits or installments of one per period for a given number of periods with interest at the effective rate per period. This factor is also known as the *Future Worth of One per Period with Interest.*

3*

SINKING FUND FACTOR

$$1/S_{\overline{n}|} = \frac{i}{S^n - 1}$$

The level periodic investment or deposit required to accumulate one in a given number of periods including the accumulation of interest at the effective rate. This is commonly known as the *Amortization Rate.*

* See † on following page.

4†

PRESENT WORTH of ONE

$$V^n = \frac{1}{S^n}$$

The present value of one to be collected at a given future time when discounted at the effective interest rate for the number of periods from now to the date of collection. This is called the *Reversion Factor.*

5†

PRESENT WORTH ONE PER PERIOD

$$A\overline{n|} = \frac{1 - V^n}{i}$$

The present value of a series of future installments or payments of one per period for a given number of periods when discounted at the effective interest rate. This factor is commonly known as the *Inwood Ordinary Annuity Coefficient.*

6†

PARTIAL PAYMENT

$$1/A\overline{n|} = \frac{i}{1 - V^n}$$

The level periodic installment‡ which will pay interest and provide full amortization or recapture of an investment of one in a given number of periods with interest at a given rate per period. A common application is as the periodic mortgage installment per dollar and is, in fact, the *Ordinary Annuity which has a Present Value of One* where n is the number of periods, and i is the effective rate.

† Figure refers to the Column number in compound interest tables, Appendix B. Except for demonstration purposes, the factors from these tables are uniformly presented in this text carried to three decimal places wherever the first figure is one or more, but to six decimal places where the factor is less than one.

‡ This factor may be found either in Column 6, or by taking the reciprocal of Column 5; that is, one divided by the factor in Column 5.

In the final analysis a value estimate is a matter of appraisal judgment. The use of mathematical tables and the above formulae is not an end in itself, but is a tool meant to assist the appraiser in arriving at a sound value estimate. Good tools do not make a good workman, but a good workman using good tools is likely to be more effective.

The tables provide a means of solving many arithmetic problems which are fundamental in the complete process of valuation.

The tabulations resulting from the above formulae aid the appraiser in applications of the capitalization process and in the analysis or testing of comparative market data to indicate a price-income relationship for a specific property.

Implicit in each precomputed factor and capitalization method are specific built-in assumptions which are automatically effected when the table is employed. It is therefore essential for the appraiser first to establish his assumptions and then to use that table or capitalization method which corresponds to the assumptions.

The appropriate capitalization rate or its reciprocal may be a composite of several ingredients involving more than one interest rate, and the segregation of income into more than one stream. There is nothing particularly complex or difficult about this. The only essential requisite, so far as mathematics is concerned, is that the arithmetic of money at interest be thoroughly understood. Thus, the point of beginning is an understanding of how the basic formulae are derived, how the various functions are related to each other, and how they may be correctly joined to form composites, whereupon the capitalization process by any technique becomes quite clear.

Except for the figure 1 and i, which may represent one dollar and the effective interest rate, there are only two quantities in all six formulae. And, since V^n is the reciprocal of S^n, the only quantity involving more than rudimentary arithmetic is S^n. It is important to grasp the nature of this function.

Amount to Which One Will Grow (S^n)

When money is invested or deposited in an account bearing interest at a fixed rate, it grows according to the interest rate and number of time periods it remains in the account. To illustrate how and why this growth occurs, assume an investment of one dollar, a nominal interest rate of 10% with annual conversion (compounding), and an investment term of five years:

Original investment	$1.00
Interest, first year at 10%	.10
Accumulation, end of 1 year	$1.10
Interest, second year at 10%	.11
Accumulation, end of 2 years	$1.21
Interest, third year at 10%	.121
Accumulation, end of 3 years	$1.331
Interest, fourth year at 10%	.1331
Accumulation, end of 4 years	$1.4641
Interest, fifth year at 10%	.14641
Accumulation, end of 5 years	$1.61051

One dollar grows to $1.61051[§] in five years with interest at 10%. And, of course, $1,000 would grow 1,000 times this amount, or to $1,610.51 in the same time at the same rate. When interest is not collected or withdrawn as earned, but is added to the capital account upon which additional interest accumulates, the result is called compounding.

The same results are obtained by the formula $(1 + i)^n$, or:

Year (or n)		
1	$1.10 \times 1 = 1.10^1$	$= 1.10$
2	$1.10 \times 1.10 = 1.10^2$	$= 1.21$
3	$1.10 \times 1.10 \times 1.10 = 1.10^3$	$= 1.331$
4	$1.10 \times 1.10 \times 1.10 \times 1.10 = 1.10^4$	$= 1.4641$
5	$1.10 \times 1.10 \times 1.10 \times 1.10 \times 1.10 = 1.10^5$	$= 1.61051$

Present Value of One Future Collection

Since one dollar would grow to $1.61051 in five years, the amount which would grow to one dollar in five years is $1 divided by 1.61051, which equals $0.620921.* In other words, one dollar to be collected five years from today would have a present value of 62.0921 cents when discounted at 10% per annum. And, of course,

§ See Appendix B, 10% Table, Column 1.

* In Appendix B, 10% Table, Column 4 shows factor precomputed.

$10,000 to be collected five years from today, when discounted at the same rate, would have a present value of:

$$\$10{,}000 \times .620921 = \$6{,}209.21$$

The $10,000 in this case is called a reversion.

The present value of each dollar of any future reversion is based on the formula $\frac{1}{(1+i)^n}$ as explained above, but may be obtained from precomputed factors, Column 4, Appendix B.

Present Value of a Series of Future Collections

This title refers to the Inwood compound interest value premise which is used in the annuity capitalization method. As illustrated above, money presently in hand commands a premium over future money. Finding the present value of a future income stream is a discounting process. On selection of the interest rate applicable, the present value of a future amount (or a series of future amounts) may be computed with reference to published tables (see Appendix B).

For example, if the amount to be received one year from today is one dollar, and if 6% per year is a fair rate of interest, then it would be justifiable to pay $0.943396♦ for the right to receive this dollar one year from today. If the cost of this right were $0.943396, and if one dollar were received at the end of the year, this income dollar would be divided between principal and interest as follows:

Return of principal	$0.9434
Interest on above for one year @ 6%	0.0566
Total received	$1.0000

If approximately 94 cents is the present value of the right to receive $1.00 of income which is to be paid one year from today, coupled with 6% interest, then the present value of the right to

♦ Appendix B, 6% Table, Column 4.

receive $1.00 two years from today is less. By reference to the same table,◊ the present value of the $1.00 that would be paid two years from today is shown as the factor .889996. Therefore the present value of $1.00 payable at the end of two years may be confirmed as follows:

Return of principal	$0.8900▲
Interest for first year at 6% on $0.8900	0.0534
	$0.9434
Interest for second year at 6% on $0.9434	0.0566
Total principal repayment and interest received	$1.0000

▲ Present value factor .889996 × $1.00 = $0.8900 (rounded).

Similarly, the present value of the right to receive one dollar at the end of three years is $0.839619,◊ at the end of four years is $0.792094,◊ and the present value of the right to receive one dollar at the end of the fifth year is $0.747258.◊ The present value of these rights to receive income at one-year intervals◊ for five years is accumulated as the present value of one dollar per annum. This is known as the Inwood Coefficient or compound interest valuation premise or, more simply, the Inwood table. Therefore the *sum* of the five individual rights to receive one dollar each year,◊ payable at the end of the year, for five years is $4.212364.△

SUM OF INDIVIDUAL PRESENT VALUE OF $1, PAYABLE AT THE END OF THE PERIOD
Column 4, 6% Table

Present value of $1 due in 1 year	$0.943396◊
Present value of $1 due in 2 years	.889996◊
Present value of $1 due in 3 years	.839619◊
Present value of $1 due in 4 years	.792094◊
Present value of $1 due in 5 years	.747258
Total (present value of $1 per year for 5 years)	$4.212364△

◊ Appendix B, 6% Table, Column 4.
△ Appendix B, 6% Table, Column 5.

The Inwood table† gives a factor representing the total of the present values of a series of periodic amounts of $1, payable at the end of each period, thus providing a shortcut for the above addition: multiplying $1 by the factor of the present value of one per year for five years develops the same present value:

$$\$1 \times 4.212364 = \$4.212364$$

Restated for appraisal practice, this table gives single factors which may be used directly to multiply periodic income to give an indication of value based upon recapture of, and interest on, capital. These present value factors are multipliers and perform the same function as the capitalization rate (not interest rate) used as a divisor in straight capitalization. Use of Inwood factors to reduce a future net income stream expectancy to a present value estimate is a direct application of the principle of anticipation, which affirms that value is the present worth of the rights to expected future benefits accruing to ownership.‡ This principle is basic to the income approach to a value estimate.

Since each factor includes within itself provision for return of principal, or recapture of the initial capital investment, in the application of annuity capitalization there is no necessity for estimation of a separate recapture rate. It should also be noted that the recapture concept is directly related to return of the investment in, or value of, the income stream, and is only indirectly related to depreciation of the physical structure which is responsible for production of the income.

Features of the Inwood method are:

1. Annual net income over the projection period is assumed to be an equal annual amount.
2. Recapture installments are relatively low initially, but increase each year.
3. Interest, being received each year on the amount of investment remaining after recapture, follows a declining curve.

† Appendix B, 6% Table, Column 5.

‡ See chapter on Basic Principles of Real Property Value.

Application of Inwood Annuity Capitalization is illustrated later in this chapter.

Hoskold Annuity (Sinking Fund) Method

The use of the Hoskold annuity factor corresponds to straight capitalization with sinking-fund recapture. The latter differs from straight capitalization with straight-line recapture only because the sinking-fund factor (expressed at a rate) is used in place of the straight-line recapture rate.

To illustrate, assume a property with a net income projection of $36,000 per year, a selected interest rate of 7% per year, a land value estimate of $80,000, and an estimated remaining economic life or projection period of 40 years.

STRAIGHT CAPITALIZATION

With Straight-Line Recapture		*With Sinking-Fund Recapture*	
Net income	$ 36,000		$ 36,000
Return on land value at 7%	5,600		5,600
Net return imputable to building	$ 30,400		$ 30,400
Interest rate	.070	Interest rate	.070
Recapture, 40 years	.025	Recapture, sinking-fund factor for 40 years at assumed safe rate of 4%§	.010523
Building capitalization rate	.095	Building capitalization rate	.080523
Building return capitalized at 9.5%	$320,000	Building return capitalized at 8.0523%	$377,530*
Add back land value	80,000		80,000
Indicated property value,	$400,000		$457,530

§ Factors for annual compounding at selected "safe" rates from sinking-fund tables. See Appendix B, 4% Table, Column 3. "Safe" rates, such as those for United States Government bonds, vary with the times and the money market.

* Figure is rounded.

The resulting indicated value will exceed that derived by straight capitalization with straight-line recapture because of these inherent assumptions. The assumption that recapture installments will be deposited to accumulate at interest is not generally considered typical of investor behavior; and, since recapture is deferred, net income remains constant and drops to zero at the end of the economic life estimate. This pattern is frequently inconsistent with typical experience. Consequently, the procedure here outlined is seldom encountered in current appraisal practice. Where such a net income pattern is apparent, as in the case of a long-term net lease, an annuity treatment is generally considered appropriate.

Hoskold factors may be used in the same manner as Inwood factors, but since the assumptions implicit in their use are different, the resulting present-value figure is altered. As previously noted, use of Hoskold factors is similiar to the straight capitalization method, but employs a sinking-fund factor instead of a straight-line recapture. The application differs, however, in that instead of applying an interest rate plus a sinking-fund♦ factor to the net income attributable to the building, the reciprocal of the resultant rate is applied as a factor. This is the Hoskold annuity factor, and it may be derived by the formula:

$$\frac{1}{\text{Interest rate} + \text{sinking-fund factor}}$$

To illustrate, assume a 7% per year interest rate and a 40-year sinking-fund factor at a 4% interest rate per year, and substitute in the formula:

$$\frac{1}{.07 + .010523\text{◊}} = \frac{1}{.080523} = 12.419, \text{ Hoskold factor for the above}$$

♦ Usually at a "safe" interest rate that is lower than the interest risk rate.

◊ This is the sinking-fund factor (Appendix B, 4% Table, Column 3, 40 years).

The similarity between the Hoskold factor method and straight capitalization with sinking-fund recapture is demonstrated as follows:

Assume a net income of $36,000 per year for 40 years with land value at $80,000, an interest rate of 7%, and a sinking-fund "safe"▲ rate of interest at 4%. The two methods may now be compared:

Annual income	$36,000
Income imputable to land ($80,000 at 7%)	5,600
Income imputable to building	$30,400

The "safe" reinvestment sinking-fund recapture rate at 4% interest is .010523 which, added to the interest rate of .07000, results in a capitalization rate of .080523.

The income of $30,400 divided by .080523 indicates:

Capitalized building value	$377,530△
Plus land value	80,000
Indicated value estimate by straight capitalization with sinking-fund recapture	$457,530△

The same result may be obtained by multiplying the net income of $30,400 imputable to the building by the Hoskold factor of 12.420 as follows:

$30,400 × factor 12.419	$377,530△
Plus land value	80,000
Indicated value estimate using Hoskold annuity factor	$457,530△

The allocation of the $30,400 annual net building income to interest on, and recapture of, the building investment of $377,530, as indicated in the first computation above, is:

Annual interest ($377,530 × 7%)	$26,427
Annual recapture sinking fund installment ($377,530 × .010523)	3,973
Total annual net income	$30,400

▲ "Safe" rate fluctuates with economic conditions, and may be disclosed by historical yields, such as those produced by United States government bonds.

△ Figure is rounded.

The $377,530 building investment figure cannot be justified mathematically unless a constant annual net income of $30,400 for 40 years is achieved. This income is necessary to provide interest at 7% per year on the building investment over the 40-year term and to deposit $3,973 each year in a sinking fund, which accumulates interest at a rate of 4% per annum, compounded annually.

In summary, the use of a sinking-fund procedure theoretically assumes that an investor is willing to place the level annual recapture payments in a safe, lower rate, interest-bearing account which will grow to an amount equaling the original building investment at the end of the 40-year projection period. Thus, in theory, at the end of 40 years, the investor has his land, a completely depreciated building, and also, as cash in the bank, the amount of his original investment in the building. This is demonstrated in the following tabulation:

RECAPTURE OF THE BUILDING INVESTMENT UNDER THE SINKING FUND CONCEPT

Year	*Building Investment*	*7% Interest on Investment*	*.010523□ Deposit*	*Sinking Fund 4% Interest on Balance*	*Sinking Fund Accumulation for Recapture**
0 (Begin)	$377,530	0	0	0	0
1st	377,530	$26,427	$3,973	0	$ 3,973
2nd	377,530	26,427	3,973	159	8,105
3rd	377,530	26,427	3,973	324	12,402
4th	377,530	26,427	3,973	496	16,871
5th	377,530	26,427	3,973	678	21,522
etc.					
40th (end)	0	26,427	3,973	0	377,530

□ .010523 is shown in Appendix B, 4% Table, Column 3, 40 years.

* May be calculated directly from Appendix B, 4% Table, Column 2, amount of one per period (paid at end of year). Negligible differences are due to precision of factors.

5 years $3,973 × 5.416323 = $ 21,519
40 years $3,973 × 95.025516 = $377,536

The accumulated growth of the sinking fund for any period can be ascertained by use of the factors from the table giving the accumulation of one per period.‡ The following table is based on

‡ Column 2, any table, Appendix B.

the assumption of deposits made at the end of the year. At the end of 10-year intervals, the accumulation is:

Year	*Percentage of Total Accumulated during 10-Year Periods*	*Percentage of Total Accumulated to End of Each Period*
10th	12.6[§]	12.6
20th	18.4	31.0
30th	28.0	59.0
40th	41.0	100.0

§ Example calculated from Appendix B, 4% Table, Column 2:

$$\frac{\text{(10-year factor) } 12.006}{\text{(40-year factor) } 95.025} = 12.6\%$$

It will be noted that the annual allocation of $3,973 per year from net income to sinking-fund recapture is constant over the 40-year period. Similarly straight-line recapture allocation is constant over the 40-year period but in the larger amount of $8,000 per year (2.5% × $320,000 building value).

This differential contributes to the higher value produced by the sinking-fund procedure. This sinking-fund accumulation procedure is based on a constant income of $36,000 per year for 40 years, rather than one which starts at $36,000 and declines $560 annually in accordance with the assumption of straight-line depreciation as illustrated in the previous chapter.

In summary, the following assumptions are inherent in the Hoskold annuity method of capitalization, as well as in straight capitalization with sinking-fund recapture.

1. Net income over the projection period is assumed to be in equal annual amounts.
2. Recapture installments are in a fixed annual amount which is less than in straight-line recapture because the annual amounts are segregated to accumulate at a safe rate of interest over the term of the projection.
3. Interest is received each year in a constant amount based upon the initial investment. (This reflects the fact that recapture is not received periodically, but is accumulating in a sinking fund to be received in a single payment at the end of the term of the projection.)

As for actually funding recapture installments, this procedure is seldom encountered except, perhaps, in the case of public buildings. Another view of the use of the sinking-fund factor is that, similar to the straight-line (age-life) depreciation factor as explained in the preceding chapter, it is a premium added to the interest rate to allow for future market fluctuations, and the funding of recapture may or may not be a physical act. This sinking-fund concept reduces the annual recapture allocation from income to a level below that of the straight-line concept and may be acceptable under circumstances where the latter concept is considered overly conservative.

Application of Inwood Annuity Method

Annuity capitalization may be combined with the residual techniques and applied in the same manner as demonstrated for straight capitalization in the preceding chapter.

BUILDING RESIDUAL—INWOOD ANNUITY

Estimated land value	$200,000
Annual net income projection before recapture of building investment	$ 36,000
Interest on estimated land value at 7% per year on $200,000	14,000
Annual net income imputable to building	$ 22,000
Assumed remaining economic life 20 years, interest 7% per year. The present value of one per annum discounted for 20 years at 7% is 10.594★	
Residual building value $22,000 × 10.594★	$233,000♦
Estimated land value as above	200,000
Indicated property value estimate	$433,000♦

★ Appendix B, 7% Table, Column 5.
♦ Figure is rounded.

This technique might be applicable where the land value is a substantial portion of the total value of the property, and the building is not new, or is not the highest and best use of the land.

The land residual technique reverses the building residual procedure.

LAND RESIDUAL—INWOOD ANNUITY

Estimated building value	$400,000
Annual net income projection before recapture	$ 36,000
Interest and recapture on estimated building value: Assumed remaining economic life 40 years, annual interest rate 7% Then the level annual amount necessary to amortize the building value in 40 years and pay 7% interest on the outstanding investment is the income attributable to the building $\frac{\text{Value}}{\text{Factor}} = \text{Income}$ or $\frac{\$400,000}{13.332◊} =$	30,000▲
Residual annual net income imputable to interest on the value of the land	$ 6,000
Residual land value $6,000 capitalized at 7%	$ 86,000▲
Estimated building value (as above)	400,000
Indicated property value estimate	$486,000▲

◊ Appendix B, 7% Table, Column 5, Inwood Annuity Factor. Present value of one per annum.

▲ Figure is rounded.

This technique is primarily applicable when the building is the highest and best use of the land, is new, or is being planned, and represents a substantial portion of the total value of the property, as assumed in the above example.

A third technique is the property residual technique in which the present value of the income stream for a selected period is added to the present value of the anticipated reversion of the property at the conclusion of the selected income stream (or selected investment life).

PROPERTY RESIDUAL—INWOOD ANNUITY

Estimated land value (for purpose of reversion)	$200,000
Annual income imputable to land and buildings before recapture of building investment	36,000
Assumed remaining economic life 20 years, annual interest rate 7%. The present value of one per annum discounted @ 7% is 10.594.△ Present value of net income expectancy $36,000 × 10.594△	$381,000□
Land reversion—the present value of one in 20 years discounted at 7% is .258419*	
Reversion value in the land, $200,000 × .258419	52,000□
Indicated property value estimate	$433,000□

△ Appendix B, 7% Table, Column 5.
□ Figure is rounded to the nearest 000.
* Appendix B, 7% Table, Column 4.

This application of the property residual technique is different from that in the preceding chapter where the property residual technique consisted of direct capitalization of net income at an over-all rate. Under this property residual—Inwood Annuity—technique, the land, or land and building, are assumed to revert to the owner at the anticipated termination of the income stream. This reversion is valued by discounting its then anticipated value to a present-day value. The total value of the property is the sum of the present value of the right to receive the projected net income plus the present value of the reversionary interest. This technique is applicable where the property as improved develops its highest value, or where land and building values cannot be readily separated, or where the estimated remaining economic life of the property is relatively short. This technique is also basic in the mortgage equity method of valuation, which is explained later in this chapter.

As noted, this property residual technique may also be used where property is subject to relatively long-term leases which tend

to support an income-stream projection at a reasonably constant level. In such a case, the projection period is usually the term of the lease or of the assumed income stream, and the reversionary interest consists of the value of the land together with the depreciated value of the improvements at lease expiration. The building component may be a substantial part of the reversionary value. Assume as above a new improvement costing $400,000 erected on an $86,000 site under a 15-year net lease at $36,000 per year, to a lessee with excellent credit rating. Since the risk inherent in this income stream is minimal, assume a 7% rate is considered appropriate in the existing investment market. On the assumption of a 40-year life and straight-line depreciation, the building reversion, based upon its assumed remaining life at the end of the lease, would be:

$$\$400{,}000 \times \frac{25 \text{ (yrs.)}}{40 \text{ (yrs.)}} \text{ or } \$250{,}000$$

The total reversion of $336,000 ($86,000 land plus $250,000 building) may be discounted to a present worth at the 7% interest rate. However, if the 7% rate reflected the appraiser's recognition of the lesser risk factor with a strong lease credit supporting the income projections, the reversion of a 15-year-old property without benefit of lease may justify a rate applicable to such properties generally, perhaps as much as 1% higher. On this basis, if the appraiser considers 8% an appropriate risk rate applicable to the reversion, the indicated property residual calculation would be as shown on the following page.

The reversion at the end of 15 years may not actually conform to the figures projected and the risk rate may change due to a different money market in 15 years. However, buyers and sellers today must reach decisions in the light of existing circumstances, and the appraiser endeavors to reflect the market created by their contemporary actions in his current value estimate. In the next example, the economic value indication, as leased ($434,000), is below the current estimated value of the land plus the building cost ($486,000). It would appear that possibly the building is an unsuitable improvement or it is leased below a fair rental level.

PROPERTY RESIDUAL—INWOOD ANNUITY
(Long-term Lease)

Estimated land value (at time of reversion)	$ 86,000
Estimated building value (at time of reversion)	250,000
Total value (at time of reversion)	$336,000
Annual net income projection for term of 15-year lease	$ 36,000
Annual interest rate, 7% on income stream and 8% on reversion	
Present value of the net income for 15 years discounted at 7% is $36,000 × 9.108† = $327,888	$328,000§
Present value of the anticipated worth of both land and depreciated building at reversion (15 years hence) discounted at 8%, factor .315242‡ $336,000 × 0.315242 = $105,921	106,000§
Indicated total value of property as leased	$434,000

† Appendix B, 7% Table, Column 5.
§ Figure is rounded.
‡ Appendix B, 8% Table, Column 4.

Selection of Methods and Techniques

No effort has been made in the preceding material to contrast the dollar results obtained by one capitalization method or technique with those obtained by another. Appropriate techniques, capitalization methods, and interest rates should be selected according to the type of property and the projected income stream and risk assumptions for the particular property being appraised. It is for the appraiser to decide which procedure may be the most suitable, and the circumstances under which a particular capitalization technique should be employed.

For the appropriate use of the residual techniques, general guidelines have been discussed in this and in the preceding chapter. The guidelines also apply to annuity capitalization:

1. If the land value is not readily estimated by market data, or if the result obtained from market data requires checking, the land residual technique may be selected and used in connection with the existing building, when this building is new and represents the highest and best use of the land. If the site is vacant, the land residual technique may be used in connection with a hypothetical building which is the highest and best use of the site, to obtain a land value estimate.
2. When land value has been satisfactorily estimated, either by market data or by the land residual technique—assuming a hypothetical building—the building residual technique may be used, whether the improvements are new or old, and whether or not they represent highest and best use of the site.
3. If a property is subject to long-term lease, or if the building, although the highest and best use of the site, is no longer new or is nearing the end of its economic life, and its value cannot be readily separated from that of the land, the property residual technique may be the most appropriate.

The variations among the capitalization methods—straight capitalization with straight-line or sinking-fund recapture, annuity capitalization with Inwood or Hoskold factors—may seem perplexing. However, each is predicated upon basic assumptions about the property's characteristics, such as its age, highest and best use, the durability and the pattern of its prospective income stream. Therefore, the basis for the appraiser's choice of method is his belief that the subject property has characteristics that conform to those inherent in the method selected. Accordingly, *each method cannot always be applied correctly to the same property.* Usually one method appears to be more consistent with the appraiser's conclusions concerning the characteristics of a particular property, and probable future trend and income behavior, interest (risk rate) and recapture requirements.

The following table, showing the extraction of the interest rate from the over-all rate, demonstrates how each capitalization method has different critical assumptions with respect to capital recapture and, therefore, a *different allocation of over-all rate* between interest and recapture provision. Assuming a land-building ratio of 20%/80%, the following three alternatives illustrate this point.

EXTRACTION OF INTEREST RATE FROM OVER-ALL RATE UNDER THREE DIFFERENT RECAPTURE ASSUMPTIONS

	Properties		
	A	*B*	*C*
Straight-line Recapture			
Over-all capitalization rate	9.00%	7.50%	6.00%
Recapture component			
40 yrs., 2.5% of 80%★	2.00	2.00	2.00
Extracted interest rate	7.00%	5.50%	4.00%
Inwood Recapture			
Over-all capitalization rate	9.00%	7.50%	6.00%
Recapture component			
Sinking fund at market interest rate, 8.75%, 40 yrs.			
.003164♦ × 80%★	.25	.25	.25
Extracted interest rate	8.75%	7.25%	5.75%
Hoskold Recapture			
Over-all capitalization rate	9.00%	7.50%	6.00%
Recapture component			
Sinking fund at safe interest rate, 4%, 40 yrs.			
.010523◊ × 80%★	.84	.84	.84
Extracted interest rate	8.16%	6.66%	5.16%

★ Ratio of building value to total value.
♦ Appendix B, 8¾% Table, Column 3.
◊ Appendix B, 4% Table, Column 3.

Indicated values that may be obtained by the various methods will not conflict when the methods are applicable to the property being appraised. The land residual and the building residual techniques produce the same result if the method of capitalization is the same, if the building is new, and when it represents highest and best use. Similarly, the building residual technique, Inwood annuity method, can be employed to produce the same result as the property residual, Inwood annuity method. The result does not differ if the interest on the land is first deducted and the balance capitalized, or if all the income were capitalized and the present value of the land reversion added. Straight capitalization

with sinking-fund recapture alternatively may be employed to produce an answer identical to the Hoskold annuity method because the two methods are the same in concept. Contrasting results from different capitalization methods using the same residual technique arise from their different inherent assumptions concerning income, how recapture is obtained, and on what amount of investment interest is being received. If the inherent assumptions in the technique used are in contradiction to those of the appraiser as to the property and the projected income stream, this misapplication of the technique results in an erroneous indication of value.

In order, these are the considerations leading to the selection of a suitable method and technique, applicable in any appraisal situation:

1. The interest rate which is appropriate to the risk
2. The method which conforms to the character and prospective behavior of income and the assumptions concerning recapture
3. The residual technique which is most applicable to the circumstances of the property being appraised.

Mortgage-Equity (Equity Residual) Method of Capitalization

The mortgage-equity method of capitalization utilizes aspects of previously described procedures but introduces somewhat different reasoning and philosophy. Previous methods treat the real estate as free and clear of encumbrances such as mortgage financing. The mortgage-equity procedure reflects a consideration of existing or typically available financing (appropriate to the specific type of income-producing property).

A sale may produce all cash for the seller, but the buyer may still obtain his purchase capital by securing as large a mortgage as possible at terms currently available in the money market. The balance of the price over the obtainable financing will be his equity contribution. The net income from such a property will therefore be utilized first to pay debt service (interest and amortization) on the loan; and the remainder will be cash flow or dividend to the equity.

In all capitalization methods the appraiser discounts anticipated future benefits to reflect their present value. Such benefits anticipated by an equity owner are twofold. First, during his tenure of ownership he enjoys a series of cash-flow dividends consisting of net income remaining after payment of debt service. Second, he may expect to profit to the extent his equity position gains value during his ownership. Without regard to accrued depreciation, enhancement in the equity may result by reason of the amortization feature of the mortgage loan. For example, assume that a property was acquired for $400,000, subject to a 70%, $280,000 fully amortizing 25-year mortgage at 8% per year interest rate. Assume that the property was held for 10 years and then sold. The mortgage terms provide amortization over the 10 years of $54,000. If this property were resold at the same price paid at acquisition, the equity position would have grown to the full extent of the $54,000. If, due to accrued depreciation, the property were sold at a price $40,000 less than cost of acquisition, the equity would still have grown in the net amount of $14,000. Any variety of situations can be assumed. It is clear, however, that where mortgage amortization exceeds depreciation, the value of the equity increases, and vice versa. Thus the yield to an equity position results from:

1. A series of cash-flow dividends▲ during the term of the investment
2. Financial gain or loss resulting from the combined effect of equity build-up and any change in the value of the property as a whole at the end of the investment period.

The equity yield rate is that interest rate at which the present value of the equity dividends for the assumed investment period plus the present worth of the equity reversion at the end of the period equals original investment.

When income taxes on earned income are high, equity growth may well be the most attractive feature of yield. While there is no doubt that the investor is interested in cash-flow dividends, they

▲ Cash-flow dividends are defined as net income after debt service.

may be rendered less attractive by prevailing high income tax rates. The equity enhancement realized by sale at the end of an investment period may be more attractive as a capital gain if it receives somewhat more favorable income tax treatment. Such equity growth may also be realized without any immediate income tax consequences by refinancing the property. The difference between the reduced old mortgage and the new increased mortgage is capital received in a lump sum without current tax liability. On types of properties where such equities represent a typical form of real estate investment, as evidenced by actual market transactions, the appraiser may give consideration to this mortgage-equity approach as reflective of market value.

In the mortgage-equity method the use of short income-projection periods is often logical. Ownership holdings of investment property may run a short term of years with the investor selling when income tax deduction for depreciation of building improvements ceases to shelter the mortgage amortization payments. Therefore at the end of the sheltered period it may be prudent for the investor to change his position by sale or refinancing. By shortening the period of projecting annual net income, the valuation has more substantial impact from the reversion and relatively smaller impact from the annual cash-flow dividend income.

In all investments the element of recapture is important. Clearly the investor deserves a return on his capital while invested, and he looks equally for return (recapture) of his invested capital. Specifically, recapture of mortgage capital is accomplished through amortization during the investment term and repayment of any balance due on the mortgage at the conculsion of the investment term. Since recapture of equity capital is accomplished by property reversion as well as dividend income, the equity investor will suffer any loss or enjoy any gain resulting from a change in property value. The provision for recapture of equity capital through income is based on the sinking-fund factor for the projection period *at the equity-yield rate.*

If the foregoing represents typical conditions, factors, and reasoning found in the market for investment properties, it is clear that a desirable appraisal aid would be a system of capitalization or investment analysis containing provision for such items. The mortgage-equity method accomplishes this objective. It begins with the appropriate over-all rate which may be supported by actual sales in the market. As previously defined, this over-all rate represents the following basic relationship:

$$\frac{\text{Net income}^{\square}}{\text{Sale price or Value}} = \text{Over-all rate (R)}$$

Interest Yield on Equity Investment

As previously stated, the net interest yield on the equity (equity yield) may come from two sources: one, the equity dividend, or cash flow after debt service; and two, the gain (or loss) in equity capital at the time of resale or reversion. In the application of the mortgage equity method of capitalization, the investment period selected should be that for which properties in the class of real estate being appraised are usually held by typical investors. Although the period of ownership and the amount of reversion (or resale price) are very important, neither of them can be empirically predicted. The shorter the time interval, the greater is the impact on yield, resulting from any change in the property value. After a reasonable assumption as to an optimum holding period has been made, and the needed data is collected to obtain the over-all rate (R), and details of existing financing are ascertained, the probable interest yield on the original equity investment may be calculated. This equity yield will vary with the extent of the assumed change in the value of the property (increase or decrease) during the holding (investment) period.

This may be demonstrated through an example postulating the following facts:

□ Before recapture or debt service.

Capital Structure	
Purchase price (or appraised value)	$400,000
Mortgage	—280,000
Equity value	$120,000
Annual Income Production	
Gross income $5,000 per month	$ 60,000
Expenses, taxes, and vacancy	—24,000
Net before recapture or debt service	$ 36,000
Over-all capitalization rate (R) $36,000/$400,000 = .09 or 9%	
Distribution of Net Income	
Net before recapture or debt service	$ 36,000
Mortgage 25 years, 8% interest per year, payable monthly	
Annual mortgage debt service $280,000 × .09264*	—25,940
Remainder to equity dividend or cash flow	$ 10,060

* Refer to Appendix B, Tables, 8%, monthly compounding. Column 6. Also American Institute of Real Estate Appraisers, *Introduction to Mortgage Equity Capitalization* (2d ed. Chicago: Author, 1972); and Charles B. Akerson, M.A.I., *Capitalization Theory and Techniques, Study Guide, Course 1-B* (Chicago: American Institute of Real Estate Appraisers, 1973).

Annual mortgage constant for the indicated 8%, 25-year loan (monthly factor .007720 × 12 = .09264 annual factor). Financial Publishing Co., *Monthly Payment Direct Reduction Loan Amortization Schedules* (12th ed., Boston: Author, 1970), p. 646. Also L. W. Ellwood, M.A.I., *Ellwood Tables for Real Estate Appraising and Financing* (3rd ed., Chicago: American Institute of Real Estate Appraisers, 1970), Part II Tables, p. 204.

It has been previously stated in this chapter that the value of the equity represents the total of, one, the present value of the equity dividend or cash flow and, two, the present value of the equity reversion. It is therefore apparent that if the value or cost of the equity today is expressed as x, then the value or cost of the equity reversion today must be x *less* the present value of the assumed annual cash flow until property reversion. This is demonstrated by applying the following calculation to the facts stated in the above example, with the further assumption that an interest yield of 9% per annum is required on equity investment.

REQUIRED VALUE AT REVERSION TO ACHIEVE EQUITY YIELD

Equity value	$120,000
Present value of cash flow is $10,060 × 6.417658†	64,560‡
The balance is the present value of the projected future worth of the reversion to be recovered at the end of 10 years (9% interest rate)	$ 55,440‡
In order to have a present value now of $55,440, the reversion must be worth in 10 years (9% interest rate) $55,440 ÷ .422411§	$131,240‡
In 10 years, at reversion, the mortgage will be paid down to $280,000 × .807297★	226,040‡
Therefore to yield 9% per year on the equity during the 10-year investment period, at the end of 10 years the property must be worth in the market $131,240 + $226,040	$357,280‡
Since the present value is $400,000 as shown above, the assumed depreciation during the holding period is $42,720 ($400,000 minus $357,280), or	10.7%

† Appendix B, 9% Table, Column 5.
‡ Figure is rounded.
§ Appendix B, 9% Table, Column 4.
★ Financial Publishing Company, *Monthly Payment Direct Reduction Loan Amortization Schedules, idem.*

If the cash flow after debt service of $10,060 for 10 years is in fact realized, the mortgage has been paid down in accordance with its terms, and the property is actually worth 10.7% *less* in 10 years, then the equity ownership will have realized a 9% equity yield rate at the end of the 10-year investment period.

Having completed the above analysis of the current fair market interest rate on equity for this example, we can now present the valuation estimate by the annuity capitalization method in simple and easily understandable terms. Again using the yield on equity at 9%, the valuation may be calculated and presented as shown on the following page.

Present value of equity cash flow (dividend) 10-year Inwood present value factor (9% interest rate) $10,060 × 6.418♦	$ 64,560◊
Present value of equity reversion 10-year present worth of 1 factor (9% interest rate) $131,240 × .422411▲	55,440◊
Total present value of equity	$120,000
Add mortgage	280,000
Total present value estimate	$400,000

♦ Appendix B, 9% Table, Column 5.
◊ Figure is rounded.
▲ Appendix B, 9% Table, Column 4.

This is the figure at which it is indicated that the property could be sold in the current market, if the assumptions are correct in regard to available financing and objectives of the typical equity investor.

Equity Yield—Reversion Relationship

Fundamentally, the above present-value procedure is based upon the current market and contemporary attitudes of purchasers and sellers. However, appraisers as well as buyers recognize that even the most probable objectives are not always achieved. It is also recognized that buyers and sellers may be influenced by other less probable but possible trends. Accordingly, it is of interest to the investor to know that even if the property declines 22.9% in value during the next 10 years, his equity yield would still be 6%. On the other hand, inflationary trends in dollar values and construction costs may result in an increase in the market price obtainable in 10 years. In this example, it is significant that if the market value increased by approximately 6% (5.6%) in 10 years, the

equity yield would be 12% per year; and if it increased approximately 27% (26.8%), the equity yield would be an impressive 15%. See Graphic Analysis and Table B, following.

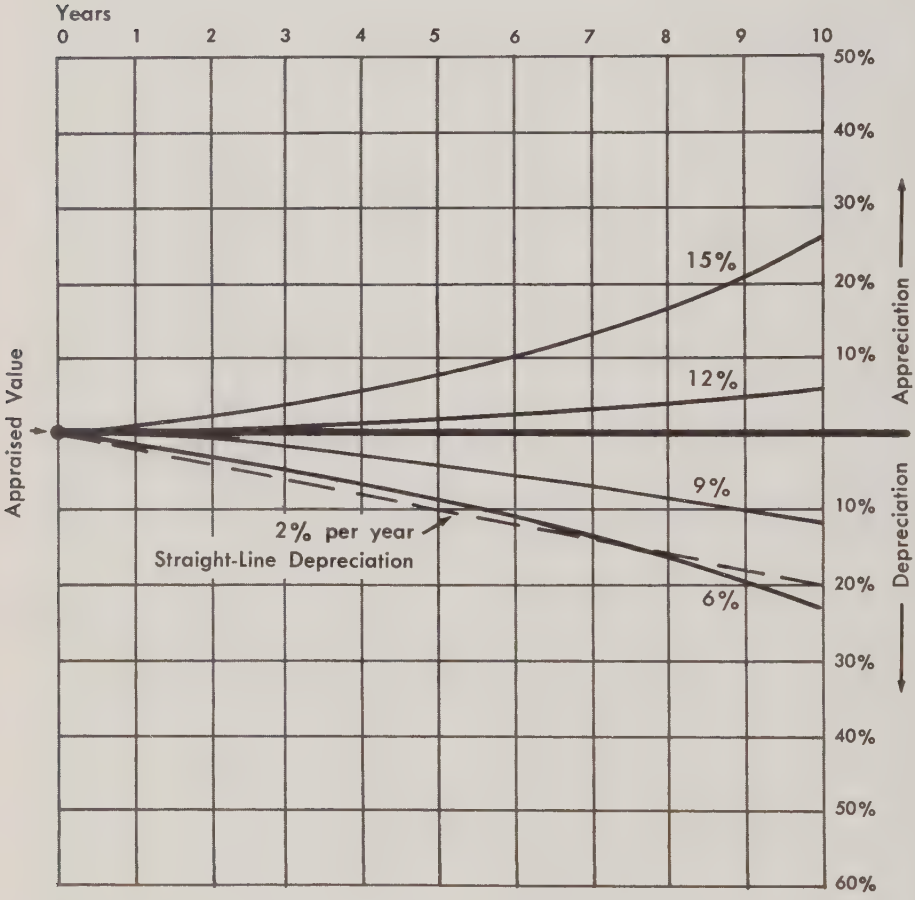
Such considerations, indicated trends, and the character of the property itself are studied by the informed investor in income property equities. The appraiser should be no less sophisticated and informed in developing his analyses and capitalization techniques.

A logical procedure now is: one, to derive an over-all (or composite) capitalization rate (R), from the best available market data on similar properties; two, to select a reasonable range of acceptable interest yields on equity; and three, to calculate the value changes which must occur at any time during the projection to achieve any yield within the range. When the result of this procedure discloses that the indicated net return on equity may produce an interest rate on the equity investment that is currently attractive in a real estate market, it provides supportive evidence of a market value at which the property could be sold. Acceptability of an appraisal of the value hinges on whether prospects for the equity yield are sufficient to attract a typical buyer.

In summary, equity yield is actually derived from both cash-flow dividend and increase in the value of the equity at reversion, which may result from an increase in the value of the property or reduction in the mortgage balance, or both. Also, within the rationalization of any over-all rate, there is a three-way relationship between the equity yield rate, the prospective amount of the cash-flow dividend, and the property value at reversion. This also is illustrated by the Graphic Analysis of a 9% over-all capitalization rate.

This graph is based upon a 70% 25-year mortgage at 8% interest, level monthly payments, as available in the current market. It shows the relationship of equity interest yield, and appreciation or depreciation of property value during an assumed investment term of 10 years.

GRAPHIC ANALYSIS OF 9% OVER-ALL CAPITALIZATION RATE



The curves on this graph are based on the following tables, A and B, and show the required appreciation or depreciation of the present value of the property which is necessary to produce an annual yield of 6%, 9%, 12%, and 15%, respectively, on equity investment within the over-all capitalization rate of 9%, for assumed 5-year and 10-year ownerships. The tables that follow the graphic analysis are constructed in accordance with these assumptions:

Value or appraisal	$400,000
Mortgage available	280,000
Equity	$120,000
Annual net income before recapture	$ 36,000
Less annual debt service (interest on, and amortization of, mortgage)	25,940
Annual cash flow (dividend)	$ 10,060

Over-all capitalization rate (R):

$$\frac{\$36,000}{\$400,000} = 9\%$$

The required appreciation or depreciation of present property value at reversion to realize selected interest yield rates on equity is shown in the following tables A (5-year investment term) and B (10-year investment term).

Table A: 5-year Investment Term

Numbers at left refer to explanatory notes following Table B.

1. Initial cash equity	$120,000	$120,000	$120,000	$120,000
2. Annual cash flow	*$ 10,060*	*$ 10,060*	*$ 10,060*	*$ 10,060*
3. Equity yield rate	*6%*	*9%*	*12%*	*15%*
4. Present value factor (5 yrs.)	*4.212364*	*3.889651*	*3.604776*	*3.352155*
5. Present value cash flow	—$ 42,376	—$ 39,130	—$ 36,264	—$ 33,723
6. Residual to equity	$ 77,624	$ 80,870	$ 83,736	$ 86,277
7. Present value factor (5 yrs.)	*.747258*	*.649931*	*.567427*	*.497177*
8. Future worth of reversion	$103,878	$124,428	$147,571	$173,533
9. Mtg. balance (5 yrs.)	258,329	258,329	258,329	258,329
10. Value at reversion (5 yrs.)	$362,207	$382,757	$405,900	$431,862
11. Required depreciation or appreciation (5 yrs.)	—9.45%	—4.31%	+1.47%	+7.96%

Explanatory Notes for Tables A and B:

Line

1. Initial equity. (This $120,000 plus amount of initial mortgage, $280,000, equals $400,000, present property value.)
2. Annual cash flow (dividend) after debt service.
3. Alternate equity yield rates on equity investment.
4. Factor—at indicated equity yield rate. Present value of one per annum for 5 and 10 years: see Appendix B, Column 5.
5. Annual cash flow of $10,060 multiplied by above factor.
6. Equity investment of $120,000 minus Line 5 equals residual portion of cash equity imputable to reversion.
7. Factor at indicated equity yield rate. Present value of one deferred 5 and 10 years: See Appendix B, Column 4.
8. Anticipated future worth of equity reversion in 5 and 10 years.
9. Add the amount of the mortgage which will remain unpaid at the end of 5 and 10 years. This 8% 25-year mortgage in an original amount of $280,000 will have an unpaid balance of 92.2604% at the end of 5 years and 80.7296% at the end of 10 years. These percentages (factors) are available in published mortgage amortization or other special tables, such as L. W. Ellwood, M.A.I., *Ellwood Tables for Real Estate Appraising and Financing* (3rd ed., Chicago: American Institute of Real Estate Appraisers, 1970), *Part II Tables*, p. 204; and Financial Publishing Co., *Monthly Payment Direct Reduction Loan Amortization Schedules* (12th ed., Boston: Author, 1970), p. 646. (continued)

Table B: 10-year Investment Term

Numbers at left refer to explanatory notes following Table B.

1. Initial cash equity	$120,000	$120,000	$120,000	$120,000
2. Annual cash flow	*$ 10,060*	*$ 10,060*	*$ 10,060*	*$ 10,060*
3. Equity yield rate	*6%*	*9%*	*12%*	*15%*
4. Present value factor (10 yrs.)	*7.360087*	*6.417658*	*5.650223*	*5.018769*
5. Present value cash flow	—$ 74,042	—$ 64,562	—$ 56,841	—$ 50,489
6. Residual to equity	$ 45,958	$ 55,438	$ 63,159	$ 69,511
7. Present value factor (10 yrs.)	*.558395*	*.422411*	*.321973*	*.247185*
8. Future worth of reversion	$ 82,304	$131,241	$196,162	$281,210
9. Mtg. balance (10 yrs.)	226,043	226,043	226,043	226,043
10. Value at reversion (10 yrs.)	$308,347	$357,284	$422,205	$507,253
11. Required depreciation or appreciation (10 yrs.)	—22.9%	—10.7%	+5.5%	+26.8%

(con.) The balance of the mortgage unpaid at any point during the loan period may also be ascertained from tables. It may be computed also from the following equation:

$$\frac{\text{Present value of 1 per period for remaining term of mtg.}}{\text{Present value of 1 per period for original term of mtg.}} = \text{mortgage balance (as percentage of original amount).}$$

Or, in the case of the above 10-year reversion example:

$$\frac{\text{15-year (180 months) remaining period (monthly) } 104.640592}{\text{25-year (300 months) original loan period (monthly) } 129.564522} = .807,$$

which is the percentage of the mortgage remaining unpaid at the end of 10 years. As the mortgage is payable monthly, these factors are, of course, from the monthly tables. Source: Financial Publishing Company, *Financial Compound Interest and Annuity Tables* (3rd ed., Boston: Author, 1961), pp. 319, 323. For the above present value factors, another source for the present value of one per year on a monthly basis for a 15- and 25-year period is *Ellwood, op. cit., Part II Tables*, p. 81.

10. The exact amount of property reversion required at the end of 5- and 10-year periods to produce equity yield rates as shown on Line 3. The difference between these amounts and the present property value of $400,000 is the dollar amount of depreciation or appreciation, which must occur.

11. The percentage of depreciation, or appreciation, in the total property value which must occur in 5- and 10-year periods to produce equity yield rates as shown on Line 3. These relationships can be arrived at directly through the use of computers, which range from the small self-contained units to the large intricate installation.

The *Ellwood Tables* provide a method of ascertaining the above percentages of increase or decrease in value at reversion by use of the following formula:

$$R = Y - MC \pm \text{Value change } 1/S_{\overline{n}|}$$

Application of this formula to the 9% column results as follows:

$$.09 = .09 - (.70 \times .010043) + (.107 \times .065820)$$

R = over-all rate .09
Y = equity yield .09
M = mortgage 70% of value
C = .010043. This is the mortgage coefficient factor which appears in the *Ellwood Tables.* It is a precalculated factor, found only in that publication, which reflects the effect of the mortgage terms on equity yield. Source: L. W. Ellwood, M.A.I., *Ellwood Tables for Real Estate Appraising and Financing* (3rd ed., Chicago: American Institute of Real Estate Appraisers, 1970), *Part II,* p. 204.

Value change: in this case 10.7% depreciation at resale (10 years).
$1/S_{\overline{n}|}$: Sinking-fund factor 10 years 9%, .065820 (Appendix B, 9% Table, Column 3).
Accordingly, when the value change in the above equation is expressed as:

$$\frac{R - (Y - MC)}{1/S_{\overline{n}|}},$$

the fact that an equity yield of 9% assumes a 10.7% reduction in the purchase price (value) on resale in 10 years is calculated as follows:

10-Year Reversion

R	*Y*	*C*	r *Y — .70C*	*Difference* R — r	*1/S$_{\overline{n}|}$*	*(Difference ÷ 1/S$_{\overline{n}|}$)* *% Appreciation or Depreciation Change*
.09	.09	.010043	.082970	—.00703	.065820	10.7% depreciation

(Explanation of this procedure may be found in L. W. Ellwood, *op. cit., Part I,* p. 87.) *C,* in third column, the Ellwood Mortgage Coefficient, may be found in *Ellwood Tables, Part II,* p. 204, Table C, 8% mortgage, 25-year amortization, 9% equity yield.

Summary

The over-all rate (net income before recapture divided by sale price or appraised value) is a combination of interest rate and recapture rate.

It may be rationally divided into any logical breakdown of these two rates that is acceptable, in the appraiser's opinion, to contemporary purchasers in the market for similar property.

Annuity capitalization is one of the methods available to the appraiser who understands the inherent assumptions made in its application as to anticipated quantity, timing, and duration of future income flow. It may be applied in the Land Residual, Building Residual, or Property Residual Techniques.

It may also be applied in the Mortgage Equity Method of capitalization in an adaptation of the Property Residual Technique. This method capitalizes the equity income (cash flow) and discounts the anticipated reversion, at the equity yield rate, after providing for annual debt service and attendant equity build up.

A supportable indication of value cannot be produced by application of any method or technique, the basic assumptions of which are inconsistent with the facts applicable to the property being appraised. Implicit in the suitability of any technique or method for the appraisal of any property is that, in the opinion of the appraiser, its inherent mathematical assumptions are applicable. Therefore, the assumptions which are implicit in any technique, method, or table used in an appraisal must be in accord with the appraiser's estimate of the quality, quantity, pattern, and durability of the probable future income stream of the property being appraised. He need only resolve in his own mind the question whether the assumptions inherent in a particular method are consistent with his opinion of the income characteristics of the property.

The following comparative summary is presented to aid in choosing an applicable capitalization method, incorporating a capitalization rate selected on the basis of pertinent facts and sound judgment.

	Capitalization Method			
	Straight△	*Inwood*□	*Hoskold*	*Mortgage-Equity*
Net Income	Declining	Level annuity	Level annuity	Level, or stabilized
Projected Term	Estimated economic life	Lease term or estimated economic life	Estimated economic life	Holding period or lease term
Investment Yield	Risk rate	Risk rate	Risk rate and "safe" rate	A weighting of mortgage interest rate, and equity yield rate
Amount Recaptured	Building investment	Capital investment	Building investment	Part or all of mortgage plus equity reversion
Recapture Term	Estimated economic life	Lease term or remaining economic life	Estimated economic life	Projected holding term or lease term
Recapture Rate	Reciprocal of estimated economic life	Sinking fund at investment yield rate for lease term or remaining economic life	Sinking fund at estimated "safe" rate for estimated remaining economic life	Sinking funds at mortgage and equity yield rates

△ Straight capitalization with straight-line recapture.
□ A common use is in the application of the property residual technique.

CHAPTER TWENTY-TWO

Valuation of Partial Interests

Partial interests in real estate may include fractional interests, ownership in land trusts, partnerships, cooperatives, condominiums, air and subsurface rights, easements, leased fees, and leasehold interests. Ownership of real property consists of a number of advantages or rights, which may be compared with a bundle of sticks. Each stick represents a certain right that may be sold, given away, or otherwise disposed of. The result is a corresponding reduction in the value of the bundle, as discussed earlier in this text.*

The material in this chapter is divided into two sections: I, Rights and Interests, covering the valuation of various legal and physical divisions of the ownership of an unencumbered property; and II, Lease Interests, including valuation of leased fees, leaseholds, and possessory interests.

I. Rights and Interests

Public Rights

In this bundle are certain rights that belong to the sovereign government and not to the private owner. All private ownership of real estate is subject to the power of the sovereign government acting in the public interest. Real estate ownership is always subject to taxation, escheat, eminent domain (condemnation), and the police power of the state.

* See chapter on the Nature of Real Property and Value.

The effect on value of the right of taxation needs little commentary here. The power to tax is the power to reduce property value or to destroy it.

Escheat pertains to the reversion to the state of property, for lack of legal heirs.

Police power pertains specifically to regulation in the areas of health, safety, morals, and general welfare; it includes regulation of land use, also of air and noise pollution by zoning, other laws, and ordinances, plus alteration of direction and arrangement of traffic patterns in streets adjacent to properties.

Under eminent domain the taking of a property or a property interest requires, in most jurisdictions, that the owner be justly compensated (for its market value). However, taking of abutter's rights under the police power in the form of street changes, such as the installation of median strips, or initiation of one-way traffic, is not usually compensable, even though an owner may suffer damage from forced circuity of travel.

Private Rights

The rights in any real estate in private ownership may be divided. The valuation of these rights begins with the value of the whole (subject to the public rights), and this fee simple estate increases or decreases in value in accordance with the advantage of its highest and best use. Division of the whole may decrease or, under some circumstances, increase the value of the parts. Like the value of the whole, the value of any partial interest may be reflected in the market.

Division of privately-owned real estate may be due to the existence of undivided fractional interests, or to a physical separation.

Undivided Fractional Interests

Division of earnings or productivity occurs when ownership rests in undivided fractional interests such as either tenancy in common or joint tenancy. A discussion of the nature of such interests may be found in other treatises on real estate and real estate law. Suffice

it for the purposes of this text to state that such an interest is usually an undivided fractional interest. The value of such fractional interests is usually less than the fraction that ownership bears to the value of the entire property, particularly where the ownership is less than a 50% interest in the property. Such ownership may be subject to a suit for partition with the possibility of sale of the property to the highest bidder. Unless the fractional owner is prepared to bid and to buy the entire property, the resulting forced sale price may be below market value.

Land Trusts

Fractional interests may be established under a land trust where title is held for the benefit of the fractional owners. The trustee is usually a bank or a trust company which performs no other duties than to hold title for the beneficiaries. Such an arrangement usually includes an agreement between the respective interests, stating the rights and the duties of the parties with respect to the operation of the property and, in the event of certain contingencies, including sale of the entire property or one of the interests. While these written agreements remove some of the risks of the bare undivided fractional interest, some risks remain, e.g., a forced sale if death of one of the parties introduces conflicting interests through inheritance.

General and Limited Partnerships

Similar to land trusts, this type of fractional ownership usually includes a multiplicity of "limited" partners who share pro rata in the net earnings and other benefits (including depreciation), but have no voice in the management decisions or responsibility. The general partners are usually the persons who developed the partnership and retained special benefits, including the right of management decisions. The value of such fractional interests usually depends on the property itself, the terms of the agreement, and the competency of the general partners.

Cooperative Apartments

While sometimes confused by the public with condominiums, there is an essential difference. Ownership in a cooperative is usually in the form of ownership of stock in a corporation owning the entire property. Each stockholding "owner" is given a proprietary lease on his apartment or unit, subject to certain conditions and obligations as to its use, subleasing, and sale. Usually lease or sale is subject to the approval of the board of directors.

Cooperative apartments eventually reach the stage where the mortgage has been paid to so low a point that a great amount of cash is required by a purchaser. Since the balance of the ownership may be satisfied with the existing mortgage balance, an owner obliged to sell may be required to finance the purchase or find the market restricted to prospective purchasers who can pay almost the entire price in cash.

Corporate Ownership

Some large projects are incorporated, and ownership is in the form of stock. One of the disadvantages of fractional-interest ownership in this form of real estate is that depreciation for income tax purposes cannot be passed through directly to the owner of the fractional interest. Ownership through corporate stock usually implies a broader ownership base involving far more people than in a partnership. One advantage of the former, however, is liquidity, since most large real estate stock issues have a proven market, with daily stock price quotations.

The value of undivided fractional interests reflects the present worth of future benefits accruing to ownership, and varies in accordance with the agreement, if any, by which they were created, and the degree of risk in ownership. Usually the market value of a fractional interest is less than the same fraction of the market value of the entire property.

Physical Division

The second category of fractional ownership is a division in the physical use of the property. Such divisions include:

1. Horizontal subdivision
2. Vertical subdivision (air and subsurface rights)
3. Easement (horizontal or vertical)
4. Condominium
5. Leased fee (creating lessee's and lessor's interests).

Horizontal and Vertical Subdivision

Horizontal subdivision, by which the boundaries of surface areas of the earth are delineated, has been discussed in the chapter on Site Analysis. However, the division of air rights and subsurface rights is a less familiar subject.

Subsurface rights in the form of oil or mineral rights are commonly leased and sold. Their exclusion may have little effect on surface land values if the terms of the conveyance protect the surface use from interference. Subsurface rights may also involve underground pipe and cable lines.

Air Rights

In the early days common law stated, "To whomsoever the soil belongs, he owns the sky and the depths." On this basis, delineation of ownership is represented by a pyramid-like shape, its apex at the center of the earth with sides extending outward through the boundaries of the site on the earth's surface. However, within the distances normally encompassed above or below this surface, real estate ownership may be considered to be between vertical boundaries above and below the site. Practically, this means that ownership of a 100-by-100-foot parcel of land is not of a square surface but of a cube. Accordingly, this cube may be divided, not only vertically, similar to a slice of a layer cake, but also horizontally, as in individual layers of the slice of cake. The useful height or depth of this cube (number of stories) is limited only by the practicalities of engineering, economics (highest and best use), and zoning.

The railroads acquired extensive areas of centrally located land when it was of comparatively little value. Now that some of it has become valuable, the railroads are endeavoring to dispose of surplus land, retaining only what they need for right of way. Past studies of

the division of air rights and railroad rights-of-way have indicated 75% to 80% of the total land value frequently is represented by air rights.† This implies that access through valuable land area might be acquired for 20% to 25% of the total land value. As the land decreases in value, the percentage of the total that must be paid for access increases. Air-right value finally reaches zero where access right and land value are the same. Where it is practical and legal for highway authorities to acquire valuable centrally located land in excess of the need for improvement, such excess condemnation may be followed by disposition of the valuable air rights.

The following formula is a logical approach to an estimate of value of an air-right interest after vertical subdivision.

Valuation Formula

$$V - (X + Y - y) - I = A, \text{ or } V - A = R$$

V = Value of the land before taking 3-dimensional interest

X = Economic value lost due to reduction of functional utility (net income) in modifying building for construction on the A interest

Y = Additional cost of constructing the building under the terms of the conveyances creating the A and R interests

y = Value of the saving in excavation or other costs owing to special advantages of the air-right site

I = Interest on investment for the additional period of construction as a result of the divided vertical interests

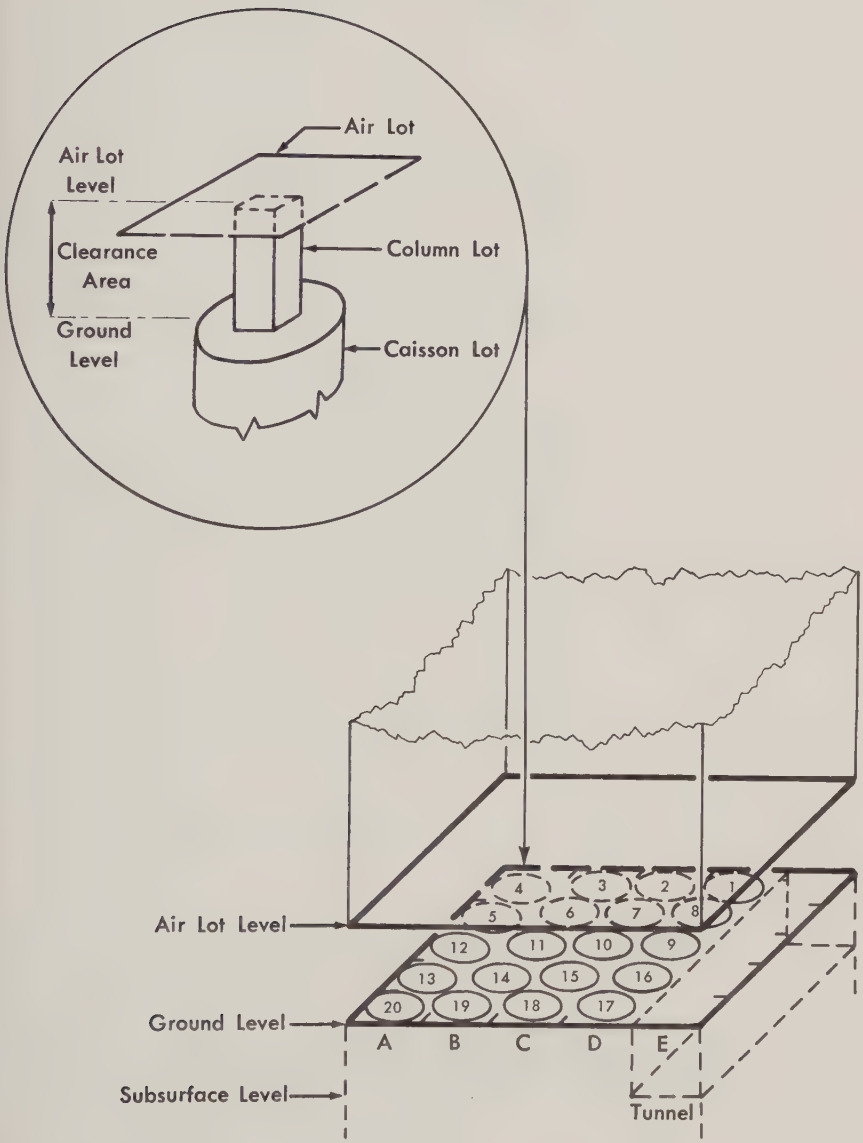
A = Value of air rights after taking of 3-dimensional interest.

R = Remainder 3-dimensional interest, $\therefore R = I + (X + Y - y)$.

The following schematic drawings show descriptive identification of: one, a vertical air-rights subdivision into air lot, column lots, caisson lots, tunnel areas; and two, air rights or easement for an electric transmission right-of-way. Horizontal and vertical dimensions with reference to city datum may, of course, be substituted for the letters and numbers in the diagrams.

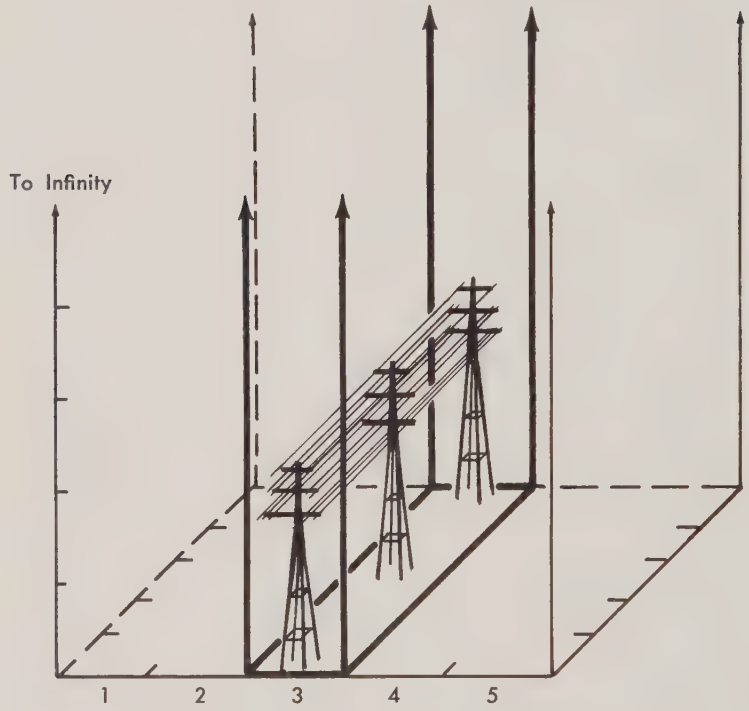
† *Air Rights and Subsurface Tunnel Road Easements* (monograph, American Institute of Real Estate Appraisers, Chicago: 1965).

THREE-DIMENSIONAL SUBDIVISION
FOR AIR AND TUNNEL RIGHTS
Schematic Drawing



Air rights:
As an example, these may be identified as air rights above air lot level
column lots between air lot level and ground, 1–20
caisson lots below ground level, 1–20
tunnel rights between ground level and subsurface level, space E

THREE-DIMENSIONAL SUBDIVISION
FOR AIR OR TUNNEL RIGHTS
Electrical Transmission Lines Right of Way



Electrical transmission rights: 3, above and/or below ground level

Like many complicated problems, the principle involved in air rights and access is simple. It may be expressed in terms of the value of the land before and after the taking of the vertical access layer. It is based on a consideration of the added cost of, and/or savings in, construction, as well as the reduction in the economic value of an improvement erected on air rights compared with that of the same improvement if erected on unencumbered land.

Example:

Assume:

V Land value‡	$200,000
X	25,000
Y	20,000
y	—20,000
I	25,000

Therefore the value of the air-rights portion of the land is indicated by this application of the valuation formula:

$$\$200{,}000 - (\$25{,}000 + \$20{,}000 - \$20{,}000) - \$25{,}000 = \$150{,}000$$

These assumptions indicate an air-rights value of 75% of the value of the land $150,000 ÷ $200,000.

Primary Factors in Variance of A and R

The terms of the rights and obligations of the two interests under the conveyance vary. As indicated above, A + R = V. Therefore the value of the 3-dimensional interest (R) for, say, a roadway is the amount of the value of the unencumbered site less the value of the air rights, or R = V − A.

Accordingly, as the burden of construction cost, interference with efficient utility, and the cost of maintenance of the building that can be built on the A interest increase, the value of the R interest increases and the value of the A interest decreases. However, this reduction in value of the A interest may be minimized:

1. By the engineer in making the design and planning of the R use:
   a. In avoiding unnecessarily long spans without supporting columns
   b. In conforming location of supporting bridge columns to bay modules suitable to the highest and best air-right structure
2. By the attorney:
   a. In avoiding excessively protective clauses in favor of R before or during construction of improvement on the A interest
   b. In eliminating excessive protection clauses in favor of R against unlikely contingencies after completion of the A improvement.

‡ Market value of land.

Easements

Easements are usually on the surface and created for the purposes of giving access to a property from a public thoroughfare or between properties, over another private ownership. They may, however, also be vertical in their definition as well as horizontal, such as underground or overhead utility lines, tunnels for railroads, subways, overhead streets, and bridges.

Interesting value questions are raised in the creation of such easements or subsurface fee title rights. A publicized explosion involving a gas main may raise questions of loss in value of the property through which the right-of-way is sought for gas mains (damage to remainder as the result of the use of the part taken). Overhead transmission towers have been increasingly designed for greater attractiveness, to counteract both the claims of unsightliness and the adverse influence on the remainder property through which the right-of-way was taken. Where a right-of-way, already in existence, is sought as adequate for a new use, an approach to its value may be the principle of substitution, i.e., the cost of acquisition of equivalent right-of-way through adjacent areas.

Condominiums

As a form of ownership rights in a property, a condominium* interest differs substantially from a cooperative interest. Ownership of a condominium unit is basically ownership of the cubical area within the confines of its outer walls, floor, and ceiling, plus joint ownership rights in all public space which, together with the condominium units, comprise the entire property. The condominium unit is a separate ownership, the title to which is in the owner. It may be leased, sold, mortgaged, or refinanced separately. While some control over tenants or purchasers is sometimes sought by a committee or board of owners, certain questions concerning the legality of such restrictions have been raised. There is much more flexibility in the condominium unit ownership than

* In some countries condominium ownership is known by the term "strata title."

in the cooperative unit ownership in regard to resale, leasing, or financing.

II. Lease Interests

Leased Fees

An owner who leases real estate transfers one of the rights in his bundle, namely the right of use or occupancy, to the tenant in accordance with the provisions of the lease contract. He retains the rights to receive rent as compensation for the temporary relinquishment of the use of the real estate. After the lease is consummated, therefore, the owner is the possessor of two major rights:

1. The lease and the income it commands
2. The title to the fee, subject to the lease, including the recovery of the use and occupancy at the expiration of the lease.

The value of a leased fee or a leasehold is profoundly affected by its duration and terms, which cover a wide range of provisions agreed to between the parties. A sample of these terms is listed in detail in order to emphasize the impact that they may have on the prospective income stream to lessor and lessee and on the value of their respective interests.

Sample Outline of Some Typical Provisions for Long-term Net Leases

Introduction

Date

Lessor

Lessee

Legal description

Matters to which lease is made subject, such as taxes, special assessments, leases, agreements, restrictions upon use, and party-wall agreements

Use of space under or upon streets, alleys, and sidewalks; agreement for joint signature of lessor and lessee to petitions and consents involving use of such space; obligation of lessee to pay city compensation

Assignment of existing leases to lessee

Term of lease

Rental

Amount, period, and amount of periodic payment, place of payment, and kind of funds

Non-abatement of rent, or conditions under which rent shall abate

Taxes and assessments payable by lessee

General real estate taxes; general and special assessments; water rates or taxes; taxes in lieu of, or in substitution, in whole or in part, for general real estate taxes, license fees, and other governmental impositions

Time when taxes must be paid

Proration of taxes and other assessments, during first and last years of term

Filing of receipts with lessor

Deposits by lessee to cover accruing taxes and use of such deposits

Right of lessee to protest taxes and conditions precedent thereto

Use of premises

Limited or specific uses

Illegal use. Obligation to comply with all federal, state, and city laws and ordinances; liquor clause; prohibiting sale or giving away, or conditions required prior to such use

Maintenance and care

To keep in good order and repair (might include a statement that premises were so received by lessee, if such is fact)

Obligation to rebuild in case of loss or damage by fire or other casualty

Alterations and improvements

Lessor's consent required

Deposit of funds and use of such funds

Waivers of lien

To become property of lessor at lease termination without compensation to lessee

Lessee not to permit overloading of building

To surrender and deliver up possession of premises at lease termination; building to be in good order and repair, ordinary wear and tear excepted

Insurance

Coverage

Personal injuries, or death, in amounts satisfactory to lessor or in stated amounts for one person and one accident; form to include contractual liability

Rent losses in amount of rent and taxes paid by lessee and in a stated form (such as 1/9th, 1/12th, or 1/24th)

Dramshop bond (if lessee is given right to sell or permit sale of liquor on or from premises) in amounts satisfactory to lessor or in stated dollar amount for injuries, death, loss of support, and property damage

Fire and extended coverage for the full insurable value

Fire and rent insurance policy to be written in name of lessor

Other policies to be written in name of lessor in its individual capacity and as trustee

All policies to be in companies satisfactory to lessor, and deposited with lessor (or deposited with insurance trustee, in which latter case loss under fire policies shall be made payable to insurance trustee)

Right (or no right) to make loss payable to leasehold mortgagee or trustee in whole or in part

Lessee to furnish an appraisal of value of building for insurance purpose upon request of lessor, not more often than annually

Lessee to maintain in compliance with rules of board of underwriters

Renewal policies to be deposited with lessor (or insurance trustee) five days prior to expiration date of policies being renewed

Loss prior to commencement of lease term

Loss after commencement of lease term; use of funds to rebuild; excess, if any, to belong to lessee if lessee rebuilds

Insurance trustee

Trustee not responsible except for fire loss proceeds it receives

Use of fire loss proceeds for rebuilding in same manner as in Article —— relating to new construction

Compensation, costs, and expenses of trustee to be paid by lessee

Right of trustee to resign. Method of appointing successor and powers of successor

Further convenants by lessee

Against liens

Against waste

Indemnity of lessor against costs, expenses, damages, fines, and attorneys' fees

Against assignment of lessee's interest directly or by operation of law (except under conditions specified)

Against subletting (except under conditions specified)

To erect no sign on building without written consent of lessor

Certain rights of Lessor

To make advances upon default of lessee

Advances to be payable as additional rent

Interest to be paid on advances

Lessor excused from inquiring into such things as validity of taxes and insurance premiums before paying

To enter upon premises at any reasonable time to inspect; and during last year (or two years) to maintain "For Rent" signs and to show premises to prospective tenants

To have lien for rent

To mortgage lessor's interest subject to lease

To transfer to assignee, deposits made by lessee, without further liability to lessee

Upon default by Lessee

Period of notice, if any, as to rent, payment of taxes, and maintenance of insurance; and as to other covenants of lessee

Lessor may distrain for rent or other moneys due

Lessor may re-enter and either terminate lease or rent for account of lessee

Receipt of rent after default not a waiver of notice of default

No waiver of a breach to constitute waiver of succeeding breaches

Lessor's remedies to be cumulative

Liquidated damages for holding-over after termination, $ _____ per day

Interest on defaults of rent and advances by lessor

Attorneys' fees incurred by reason of lease and in enforcing lease

Receiver to be obtained under certain conditions

Rights and obligations of mortgagee of lessee's interest

Eminent domain—entire or part of premises

Taking for use

Taking of fee title

Rights of lessee in event of ouster, limited to rent reserved during period lessee is deprived of possession

Covenants to run with land

Notices

Registered mail or delivered in person

Addressed to lessor at _____

and to lessee at _____

Proof of service

Limitation of lessor's liability, in capacity as trustee, to property or trust estate

Signature clause

Clauses for Special Uses

Percentage rental

Restrictions with respect to conducting business

Manner of computing percentage rental

Form of statement or audits; when they are due; lessor's right to examine books, and manner of preserving claim

Due date for payment of percentage rental during term and for last period of term

No relation of partnership created—only that of lessor and lessee

Sale of present improvement to lessee

Construction of new building

Obligation to build, and date for completion

Kind of improvement and restrictions with respect thereto

Approval of plans and specifications

Deposit of funds prior to wrecking present building

Application of deposited funds

Right of lessee to enter into party-wall agreements and restrictions and limitations thereon

Deposit of security for lessee's performance or for special purposes, together with disposition of such funds.

Variation in Types of Long-term Leases

Leases vary in term and type of rental agreements. Such variations, however, do not change the basic principle that the leased fee interest is limited by the contract rent, and the leasehold value is limited by the amount of the economic rent which the lessee can keep after paying the contract rental to the lessor.

In general, long-term leases may be classified as those extending from 10 to 99 years or more. The probable life of the existing, or of a proposed new, building frequently is a determining factor when the lessor and lessee agree upon the lease term. There are several types of long-term leases, which are distinguished by their rental provisions.

The *flat rental lease* provides that the lessee pay a fixed rental (annually, quarterly, or monthly) for the entire term of the lease. This type of lease resembles a sale, in that any subsequent increase in dollar earnings of the property during the lease are not participated in by the lessor.

The *graduated* or *step-up lease* provides that the rental shall be increased at various stipulated times in the future. The purpose of this lease is generally to provide a lower rental in the earlier years, to enable a new improvement to become established in its earning power. Sometimes it may be an attempt by the fee owner to participate in anticipated increase in earning power. The problem with this form of lease has been that often it is made at the top of a real estate cycle, and in times of recession, the step-up provisions are difficult for the lessee to meet.

The *step-down lease* usually is an attempt by lessor and lessee to take advantage of the lessee's ability to pay a high rent in the immediate future. In later years, the burden is eased. Often a tax situation favors the employment of this device.

The *revaluation lease* is another effort by the lessor to participate in any future increase in economic rent. Such leases often provide that every 10 years the property shall be revalued and the rental shall be based upon an agreed interest rate on

this value. These leases usually provide for the appointment of appraisers or arbitrators by the lessor and lessee, if they cannot agree upon a value. Also, such leases often provide for the selection of a third party acceptable to both, in the event that the appraisers cannot agree.

The history of the revaluation lease shows that lessors and lessees seldom agree. Frequently, persons appointed are not appraisers, but are advocates, acting only upon the advice of lessor or lessee. Thus the rental that eventually emerges from the revaluation proceedings under such circumstances is a matter of chance. If the lessor and lessee each were to appoint an objective and competent individual—an appraiser—there should be no difficulty in agreeing on a third appraiser. The value determined should be fair to both lessor and lessee. However, even assuming a fair revaluation lease calling for current land value based on highest and best use, the lease may become a heavy liability to a lessee. If the existing building is still unamortized, and conditions have changed, it may no longer represent the highest and best use which could support the full current economic rental value of the land. The problem with this form of lease results from its often being made at the top of the real estate cycle: in times of recession, the step-up provisions may be difficult for the lessee to meet.

The *index lease* is another attempt on the part of the lessor to protect himself against possible future loss. This form of lease ideally gives the parties protection against variation in dollar productivity brought about by a change in purchasing power. A recognized national index of the value of the dollar is used, and the rental under the lease is adjusted in accordance with this index.

In an inflationary situation, such a lease might prove to be unfair. If the economic rent of the land and building does not keep pace with building costs, high building prices might adversely affect residual land value. It does not always follow that the value of land will decrease or increase in the same measure as economic rentals or the purchasing power of the dollar.

The *percentage lease* is perhaps the most effective attempt on the part of the lessor to benefit from the rent produced by the property. In the case of a retail store, the percentage lease provides that the lessee pay to the lessor a fixed percentage of retail sales transacted on the premises. Different types of retail business can afford to pay different percentages of their retail sales as rental. If the percentage rental in any lease is fair in accordance with rental usually paid by businesses similar to the lessee's, such leases tend to produce the economic rent of the property. However even these percentages often change because of changes in operating costs or net retail (profit) margins over a long period of time. The rental obtained at the percentage prescribed in the lease eventually may produce either more or less than the then current economic rental value.

Another arrangement is the *lease-purchase agreement,* whereby the real estate owner transfers the title to his property to another party—usually an insurance company, foundation, or other institution—and takes back a long-term lease. By becoming a lessee rather than an owner, certain advantages accrue. The properties involved in such transactions are usually single-occupancy properties used by the lessees in their own businesses. The two principal advantages in being a lessee, rather than a real estate owner, are that this arrangement permits the lessee to use his capital in his business instead of tying it up in real estate, and that, as a lessee, he may have certain tax advantages over his position as an owner, such as charging off rent (instead of depreciation) as an operating expense. Often such sales are not evidence of value. The purchase price paid for the leased property is characteristically based upon the rental that the lessee agrees to pay. If the purchaser depends primarily upon the credit standing of the lessee, the value of the real estate becomes a secondary consideration. Therefore the amount of the lease rent is largely a matter of satisfying the needs and convenience of the lessee. Under such distinguishable conditions either a positive or negative leasehold value could exist at the time the transaction is concluded.

All of these types of long-term leases create a division of rights

and advantages in properties, as between leased fee and leasehold interests.

Nature of Lease Interests

When a lease has been executed, the bundle of rights in the real property becomes divided into two separate interests, commonly referred to as the leased fee estate, and the leasehold estate:

> The leased fee estate consists of the right to receive the contract rent provided by the lease, the reversion of the real estate at the end of the lease, plus any other benefits but minus any penalties according to the provisions of the lease.
>
> The leasehold estate consists of the use and occupancy of the real estate, the value of which arises from the margin of the economic productivity of the property, subject to meeting the terms and provisions of the lease.

When a fee, subject to a long-term lease, has been sold, published news articles often quote the sale price, which may then be expressed as the price per front foot or per square foot. Sometimes uninformed persons accept the sale of such a leased fee as evidence of the current market value of the fee unencumbered by a lease. This interpretation indicates a lack of understanding, in that although a sale has taken place, the sale does not include all of the property rights which accompany an unencumbered ownership of the real property.

Basically, the valuation of a leased fee or leasehold is a matter of dividing the value of the real property, free of the lease, into separate values imputable to the leased fee and leasehold interests. The sum of the values of the fee, subject to the lease, and leasehold interests, tends to be the same as the value of the property free and clear. However, under certain circumstances, the total value of the property as a unit can be more or less than the sum of the fee and leasehold values. It can be more if a financially capable lessee were liable for contract rent in excess of the present fair economic rent. If these circumstances exist and the leased fee

interest exceeds the value of the property on an unleased basis, then the property is composed of both tangible and intangible components. The definition of real property embraces the idea that property rights may attach to tangibles, such as real estate, and to intangibles, such as a lease favorable to the property owner.

Contract and Economic Rent

If the real estate currently is leased at its fair rental value, contract rent and economic rent are the same. However, in time, with changing conditions affecting the physical real estate and its earning power, or with changes in the purchasing power of the dollar, contract rent and economic rent tend to separate. Accordingly, analysis of leases which have been in effect for some time discloses that if the factors influencing the value have been favorable since the lease was executed, the current economic rent exceeds the contract rent with resulting enhancement in value of the lessee's leasehold interest in the property. Conversely, in instances where economic factors affecting value have been unfavorable since a lease was made, or where contract rent was established on too high a basis, contract rent may exceed current economic rent. In this situation, the value of the leasehold interest is adversely affected. A negative leasehold interest is created reflecting the extent to which the capitalized value of the excess rental liability detracts from the value of the leasehold estate. If this negative interest is substantial, reaching a level where it becomes too burdensome, the tenant may default, and legal proceedings or rental adjustment may result. A financially sound lessee may be obliged to meet the contract rental payments. There are instances where lessees have paid to be relieved of this liability, thus in effect purchasing the negative leasehold interest. In other cases where only the land is leased and the lessee has constructed the building, the currently excessive contract rent may cause the fee interest to encroach upon the value of the building.

For example, assume that a property on a retail business street

consists of a parcel of land subject to an existing ground lease with a contract rent of $20,000 per year. The lessee built a two-story commercial building and operates the real estate which produces a net income of $42,000 per year. The present value of the land, free and clear, for its highest and best use is $200,000, and 7% is a fair rate of interest on the current land value. Under these circumstances, if the real estate were free and clear of lease, the return on the building investment over and above the fair economic rental value of the land would be as follows:

Present annual net income to lessee	$42,000
Economic annual rental value of land $200,000 × .07	—14,000
Balance imputable to the building	$28,000

However, the owner of the building does not own the land, but has possession under a long-term net lease at $20,000 per annum ground rent, which results in a balance imputable to the lessee's interest as follows:

Present annual net income to lessee	$42,000
Contract rent under terms of ground lease	—20,000
Balance imputable to lessee's equity in building	$22,000

Therefore the lessee must pay to the owner of the fee $6,000 of the $28,000 he should receive as building income. In effect, the lessor's interest has come to include not only the value of the land, but part of the economic value of the lessee's building as well.

Conversely, where economic rent exceeds contract rent, a positive leasehold interest in land is created. For instance, if in the previous example the contract ground rental were $10,000, the lessee's position would be as follows:

Present annual net income to lessee	$42,000
Contract rent under terms of ground lease	—10,000
Balance imputable to leasehold estate, which now includes an interest in the land as well as the building	$32,000

In this situation the lessee's interest consists not only of the building, but also includes a substantial leasehold interest in the land by virtue of the fact that he is paying $4,000 less per annum than its current economic rental value.

Similarity between Leasehold and Equity Interest

There is a similarity between a leasehold interest and an equity interest. In a leasehold interest, the lessee enjoys possession of the real estate, subject to the provision that he must pay the rental reserved in the lease. Remaining net income accrues to the lessee. In an equity interest, the equity owner owns the real estate, subject to the rights of the owner of the mortgage to receive interest and principal payments as provided. In appraising a leasehold interest, the appraiser recognizes this similarity in giving consideration to the selection of a capitalization rate reflecting the risk in the lessee's interest. At the same time he recognizes that the lessor's interest—the ownership of the leased fee—bears the characteristics of a first mortgage in many respects, such as risk of collection. It follows that if the original lessee has subleased to a third party, the sublessor's interest has risk characteristics similar to those of a second mortgage. The sublessee has the equivalent of the equity position.

Valuation of Leased Fee Interest—Land Reversion. In the valuation of leased fees, the amount of the rental income is set by contract, and need not be estimated by the appraiser. However, the appraiser estimates the net rental value of the real estate free and clear, so that he may ascertain the margin of security between the economic rental value of the real estate and the contract rent reserved in the lease. Thus he may judge the element of risk that the owner of the leased fee interest is assuming in anticipating the payment of the contract rent. The estimate of this risk is the appraiser's principal problem in arriving at the value of the leased fee. A greater margin of security reduces risk and is one of the factors influencing the interest rate acceptable in the market.

The fixed contract rent for the term of the lease is income with

the characteristics of an annuity. This calls for the application of factors from the present-value tables[§] at an appropriate rate of interest for the remaining term of the lease. This computation produces the capitalized value of the rentals, which may be the greater part of the value of the leased fee.

The next step is to value the present worth of the property that reverts to the lessor at expiration of the lease. The reverting property may be either the land only, or land and building together. The reasonable view is that the reversion is of land only where the lease extends to or beyond the remaining economic life of the building. Here the value of the land at the time of reversion is usually assumed to be the same as at the present time. Any error in this assumption is minimized because the table for the present worth of one substantially discounts the future reversion. A 7% per annum discount rate applied for a 20-year period produces a present value of only 26 cents on the dollar of the face amount; and for a 50-year period, less than 3½ cents on the dollar.[★]

For example, assume a parcel of land with a present value of $200,000 which is, or may be, leased for 20 years on a basis of 7% yield per annum or a net ground rental of $14,000 per year. The following calculation of value would be applicable:

Annual net rental 20 years	$ 14,000
Present value of contract rent for 20 years discounted at an interest rate of 7% per annum $14,000 × 10.594014[♦]	$148,316
Present value of the anticipated reversion of the land at the expiration of the lease discounted at the rate of 7% per annum $200,000 × .258419[★]	51,684
Total value of leased fee	$200,000[◊]

§ Appendix B.

★ Appendix B, 7% Table, Column 4.

♦ Appendix B, 7% Table, Column 5.

◊ Note that this achieves the same results as

$$\frac{\$14,000}{.07} = \$200,000.$$

Valuation of Leased Fee Interest—Property (Land and Building) Reversion. When the reversion involves both land and building at the end of the contract term, the appraiser is faced with the problem of supporting a value for the reversion before applying the discount factor. Again, the usual concept is to consider the land to have the same value at the time of reversion as it has at the present time. If the appraiser believes otherwise, and supports his opinion, he may adjust the land reversion figure. The improvements will be older at the expiration of the lease and should be depreciated accordingly. One method of estimating the present worth of the reversion might be:

Lease term—20 years		
Land—by comparison		$ 80,000
Building—(assume new) value today	$400,000	
Assumed depreciation in 20 years	50%	
Building value, at end of 20 years		200,000
Total reversion		$280,000
Present value factor for 20 years, at assumed 8% rate		×.214548▲
Present value of property (land and building) reversion	say	$ 60,000

▲ Appendix B, 8% Table, Column 4.

Essentially this computation applies a cost approach to the reversion component of value. The appraiser could support this conclusion if he applied the market data approach to the reversion by substantiating the estimate of value in the future by comparison with similar existing 20-year-old buildings. He also could develop an income approach, although projecting an estimate of economic rental 20 years from now borders on the theoretical to a degree that might detract from the acceptability of the conclusion.

Valuation of Leased Fee and Leasehold Interests. The following three examples demonstrate a procedure in processing contract

and excess rental in estimating the value of the leased fee and the leasehold interests where the site has a value of $80,000 and is improved with a new building having a (cost) value of $400,000.

EXAMPLE 1. Annual contract rent and economic rent are the same. 20-year lease. Building reversion at end of lease assumed at 50% of present value. (8% interest rate is assumed as applicable.)

Annual contract rent	$ 42,800
Economic annual rental value	$ 42,800
Present value of contract rent for 20 years, discounted at 8%:	
$42,800 × 9.818□	$420,000*
Present value of property reversion as above	60,000*
Total value of lessor's interest	$480,000*

□ Appendix B, 8% Table, Column 5, 20 years.
* Rounded to nearest 000.

In Example 1, the contract rental equals the economic rent. In theory, the leasehold has no value, since there is no margin of net income attributable to the leasehold interest, and the value of the lessor's interest is the value of the property. However, possession of the premises under the lease may in certain circumstances have some value to the lessee.

EXAMPLE 2. Annual contract rent is less than economic rent. 20-year lease. Same economic rent and property reversion assumed as in Example 1.

Annual economic rental value	$ 42,800
Annual contract rent	36,000
Lessee's annual advantage	$ 6,800
Lessor's Leased Fee Interest	
Present value of contract rent for 20 years discounted at 7.5%:	
$36,000 × 10.194† = $366,984	$367,000‡
Present value of property reversion in 20 years discounted at 8%:	
$280,000 × .214548§ = $60,060	60,000‡
Total present value of lessor's leased fee interest	$427,000‡

Lessee's Leasehold Interest	
Present value of lessee's $6,800 annual rental advantage for 20 years, discounted at 11.5%: $6,800 × 7.710★ = $52,428	$ 53,000‡
Total value leased fee and leasehold interests	$480,000‡

† Appendix B, 7½% Table, Column 5, 20 years.
‡ Figure is rounded.
§ Appendix B, 8% Table, Column 4, 20 years.
★ Appendix B, 11½% Table, Column 5, 20 years. The factor to produce $53,000 would be $53,000 ÷ $6,800 = 7.794, which by interpolation would be at an interest rate of approximately 11.34%.

In Example 2 a 7.5% interest rate is used in capitalizing the leased fee interest. This rate is selected to illustrate the reduced risk of collecting the contract rent because it is below economic rent. Interest rate applicable to reversion is unchanged at the 8% rate selected above as appropriate for the type of property. However, an interest rate of 11.5% is used in capitalizing the lessee's rental advantage in estimating the value of his leasehold interest. In this case it may be noted that the total of the two interests is the same as the value of the entire property as shown in Example 1. While the total of the two interests may differ, there is a tendency for the total of the separate values of the divided interests to equal the value of the whole property as a single unit of ownership. Thus the value of a leasehold estate may be indicated by the difference between the value of the property and the value of the lessor's interest. It is common practice to check leasehold value on this premise. The risk rate appropriate to the lessor's estate can usually be estimated from data on current interest rates, within a reasonably narrow range. Thus Example 2 might be developed as follows:

Estimated property value as in fee (Example 1)	$480,000
Less estimated value of lessor's interest (Example 2)	427,000
Estimated value of leasehold estate	$ 53,000

The approximate risk rate applicable to the leasehold estate may then be computed through interpolation using Inwood

factors. The 20-year present value factor applicable to the leasehold is:

$$\frac{\text{Value}}{\text{Income}} = \frac{\$53{,}000}{\$\ 6{,}800} = 7.7941$$

This is equal to a compound interest factor for the present discounted worth of one per annum for 20 years at an interest rate between 11% and 11.5% per annum.

	Rate	*Factor*	*Factor*	
	11%	7.963	7.963	
	(Target)		7.794	(Factor applicable to the leasehold)
	11.5%	7.710		
Difference	.5%	.253	.169	

The leasehold rate is 11% plus a fractional part of the distance to 11.5% represented by $\frac{.169}{.253} \times .5\% = .34\%$. Hence, by interpolation the developed interest rate applicable to the leasehold estate is 11.34%.

EXAMPLE 3. Annual contract rent is in excess of economic rent. 20-year lease. Reversion, same as Example 2.

Annual contract rent		$ 48,000
Annual economic rental value		42,800
Lessor's excess rent		$ 5,200
Present value of economic rent as in Example 1		$420,000
Present value of reversion as in Example 1		60,000
		$480,000
Value of lessor's excess rental		
Present value of lessor's $5,200 annual excess rental advantage for 20 years discounted at 11.5%:		
$5,200 × 7.710♦	say	$ 40,000

♦ Appendix B, 11½% Table, Column 5, 20 years.

The value of these two lessor's interests may be summarized:

Value of leased fee (lessor's interest in property)	$480,000
Excess value due to favorable lease	40,000
Total value of lessor's interests	$520,000

The excess value due to the favorable lease in this example is not imputable either to land or building, but is a third element. If these circumstances exist and the combined interests of all parties total more than the value of the property on an unleased basis, then the property is composed of both tangible and intangible components. This concept has been referred to as the two-property concept▲ which affirms that property rights may attach to tangible things, such as real estate, and to intangible conditions, such as the existence of a lease favorable to the property owner.

The above $40,000 excess value due to a favorable lease is secured by the credit of the lessee, rather than by the intrinsic value of the property leased. Therefore it takes the characteristics of an obligation of the lessee, secured only by the lessee's credit. Its capitalization into value should therefore be at a risk rate consistent with the contractual obligation and credit standing of the lessee. Such excess value due to a favorable lease is therefore an asset to the lessor and an obligation of the lessee.

In Example 3, an 11.5% interest rate is used in capitalizing the excess rent (over economic). However, this risk rate varies with the obligation of the lessee and his credit standing. Payment of the excess rent may be additionally secured by any investment of the lessee in improvements to the property. Some leases provide that the lessee may be relieved of all obligation by transferring the lease.

The above three examples are presented for the purpose of illustrating a logical procedure in estimating the value of leased fees, leasehold interests, and excess value due to a favorable lease.

▲ George L. Schmutz, *The Appraisal Process* (North Hollywood: Author, 1951), pp. 14–16.

Also illustrated is the tendency of risk to decrease or increase the appropriate interest rate used in capitalizing net rent into a value estimate.

One element of risk that has not been discussed is the risk of a change in money value (inflation or deflation). Many old leases made prior to 1930 carried clauses that the rental was to be paid in gold. When the United States discontinued its gold standard, this clause became inoperative. As a result, rental obligations carry the risk of future payments in money of a changed purchasing power. This has the effect of increasing the risk factor acceptable to purchasers of leased fees for long terms. Therefore, the acceptable interest rate on long-term leased fees increases as the assurance of receiving the income dollars of unchanged purchasing power decreases.

Sandwich Leases. If a property is leased and then subleased, the original lessee becomes the owner of a sandwich leasehold. His position is between the original lessor and the sublessee. In complex situations, there can be more than one sandwich position. There is no particular difficulty in valuing an intermediate position in a parcel of real property, if all the facts are known. The owner of a sandwich lease has the right to retain the margin of contract income between that which he receives from the sublessee and that which he pays to the owner of the leased fee. A sandwich leasehold is an intangible, in that there is no right to use and occupy or ultimately to repossess the physical real estate. The rights of this leaseholder terminate at the end of the original lease.

Occasionally, the sandwich lessee finds himself faced with default by the sublessee, and he is obliged to step in to operate the property. This circumstance and any other potential hazards are reflected in the capitalization rate applicable to the income retained by the sandwich lessee.

Assume, similar to Example 2, a leased fee with 20 years remaining on a net lease at $36,000 per year. The lessee has subleased at $39,500 per year to expiration of the 20-year term so he is now in the sandwich position. The economic rental value of the prop-

erty is $42,800 per year. Selected interest rates are: leased fee, 7.5%; sandwich interest, 9%; sublessee's interest, 15%. Reversion value is the same as in Example 2.

The value of the leased fee interest consists of:

Present value of contract rent	
$36,000 × 10.194△ = $366,984	$367,000*
Present value of reversion	
$280,000 × .214548□ = $60,073	60,000*
Total present value, leased fee interest	$427,000*

The value of the sandwich interest is predicated on the margin of net income retained each year and may be estimated as:

$39,500 minus $36,000 equals $3,500 per year for 20 years	
Present value $3,500 × 9.128‡ = $31,948	$ 32,000*

The sublessee's interest is predicated on the margin between the economic rental value of $42,800 per year and his contract rental payment of $39,500 per year. The value of this interest may be estimated as:

$42,800 minus $39,500 equals $3,300 per year for 20 years	
Present value $3,300 × 6.259† = $20,655	$ 21,000*
Total leased fee and leasehold interests	$480,000*

△ Appendix B, 7½% Table, Column 5, 20 years.
* Rounded to nearest 000.
□ Appendix B, 8% Table, Column 4, 20 years.
‡ Appendix B, 9% Table, Column 5, 20 years.
† Appendix B, 15% Table, Column 5, 20 years.

Again, the sum of the interests is shown to be equivalent to the value of the property.

In this case, the sandwich position, which consists of the right to collect a margin of $3,500 per year, is relatively well secured. It is not as secure as the underlying fee, rated as 7.5%. It is better secured than the subleasehold, at 15%. A 9% rate appears reasonable.

In the absence of a reasonable basis for judgment estimates leading to the 9% and 15% rates attributable to the leasehold

interests above, the appraiser may first estimate the combined value of the two leasehold interests as:

Estimated value of property as in fee	$480,000
Less estimated value of lessor's interest as computed above	427,000
Estimated value of combined leasehold interests	$ 53,000

The over-all rate applicable to the combined leasehold interests previously computed through interpolation in present value tables is 11.34%.[§]

The better secured sandwich position merits a risk rate below this level, influenced by factors such as the ability or credit of the sublessee and consideration of the extent of his investment or commitment to the leasehold estate which may increase his incentive to continue his leasehold position.

In order to maintain the 11.34% combined level, a higher rate is applicable to the sublessee's interest, and a judgment decision may be made by the appraiser concerning an appropriate separation of this 11.34% into two applicable rates. If a rate applicable to either leasehold position can be rationalized or supported by market data, the rate applicable to the other may be computed as that rate necessary to maintain the 11.34% combined level.

Rounding the figures in the situation above produces the following allocations of value:

		Percent of Total	*Interest Rate*
Leased fee	$427,000	89.0	7.5%
Sandwich leasehold	21,000	4.4	9%
Top leasehold	32,000	6.6	15%
Total	$480,000	100.0	

The sum of the leased fee and leasehold interests, as previously stated, may be worth more or less than the real estate free and clear. In order to appraise a fee or a leasehold, the appraiser must be familiar with the terms of the lease, since it is a contract which

§ Appendix B, Tables 11%/12%, Column 5.

divides the property rights between the lessor and the lessee in accordance with its terms. These terms may adversely affect the lessor's interest; or they may restrict the lessee in utilizing the full present or potential productivity of the real estate.

For example, there have been instances of long-term leases in which the lessee does not have the unrestricted right to raze the existing building and build a new one. This could occur when the structure is obsolete and ready for razing, and the lessee desires to build a new modern improvement but the lessor withholds his consent. He may hope to obtain a revision of the lease terms in his favor, thereby recapturing part of the leasehold interest. This prevents the lessee from improving the real estate to its highest and best use and from realizing its full potential return. Another example might be a lease nearing its expiration, and the remaining term may not warrant the lessee's constructing improvements representing the highest and best use. Here again, the sum of the fee and the leasehold interests may be worth less than the value of the whole.

To an extent, leasehold values may also be restricted by lenders' prejudice against leaseholds as security for loans, or by existing state laws. Some insurance companies have been prohibited by law from lending on leaseholds. Others will not lend on leaseholds because of the similarity of a leasehold loan to a second mortgage. Any lack of available financing tends to limit the number of potential purchasers and to depress the price. Under all of the above circumstances, the sum of the prices obtainable for the sale of each separately at a given time may be less than the amount that a single purchaser would pay for the two together, i.e., the value of the unencumbered fee.

Graduated Rentals

The tables giving the present value of an ordinary annuity of one per period* permit calculation of the value of segments of income to reflect the mathematical consequences of variations in

* Commonly known as the *Inwood Ordinary Annuity Coefficient,* shown in Column 5 of Tables, Appendix B.

an income stream. Assume two identical plots of land, A and B, each under a 50-year ground lease with a lessee of the same quality. The leased parcels are valued at $80,000 each, although the amount and time of rental payments stipulated in the leases vary. The lease on land plot A provides a level annual rental of $6,400 per year for the entire term of the lease. The lease on land plot B provides for an annual rental at $5,500 per year for the first 5 years of the lease, $6,000 per year for the second 5 years, $6,500 per year for the third 5 years, and $7,623 per year for the remaining 35 years.

Assuming the same 8% risk rate, both income streams will reflect the same value of $80,000 for the leased fee, using present value tables♦—property residual technique—as shown by the following:

PLOT A—LEVEL ANNUAL LEASE RENTAL

Present value of $6,400 per year		
$6,400 divided by .08		$80,000
or, using present value tables—property residual technique, 50 year term		
$6,400 × 12.233◊	$78,294	
Plus reversion		
$80,000 × .021321▲	1,706	
		$80,000

PLOTS A AND B—ANNUAL LEASE RENTAL BY GRADUATED STEPS

	Present Value	
	Plot A Level Annual Rental	*Plot B Graduated Annual Rental*
Step 1		
Present value of first 5 years' income		
8% factor 3.9927◊		
A: level income $6,400 × 3.9927	$25,553	
B: graduated income $5,500 × 3.9927		$21,960
Step 2		
Present value of second 5 years' income		
8% factor 6.7100◊ — 3.9927◊ = 2.7173		
A: level income $6,400 × 2.7173	17,390	
B: graduated income $6,000 × 2.7173		16,304

(continued)

Brought forward	$42,943	$38,264
Step 3		
Present value of third 5 years' income		
8% factor 8.5595◊ — 6.7100◊ = 1.8495		
A: level income $6,400 × 1.8495	11,837	
B: graduated income $6,500 × 1.8495		12,022
Step 4		
Present value of last 35 years' income		
8% factor 12.2335◊ — 8.5595◊ = 3.6740		
A: level income $6,400 × 3.6740	23,514	
B: graduated income $7,623 × 3.6740		28,008
Total present value 50 years' income	$78,294	$78,294
Add reversion as before	1,706	1,706
Total value, leased fee interest	$80,000	$80,000

In summary, capitalization in perpetuity at the selected risk rate, or application of Inwood annuity factors to net rent, produces the same mathematical result if the same interest rate and reversion assumptions are applied. The use of annuity tables, however, provides a flexibility which permits capitalization of varying income and reversion situations. In the above example, the level income and graduated income capitalize to the same value. In actual practice, they vary in accordance with the amount and timing of the rental payments. For example, consider the same 50-year lease with the same *average* annual rent of $6,400 per annum, but with the first half of the period at a lower annual rental and the second half at a correspondingly higher rental level:

Present worth of 50 years' rental:	
First 25 years @ $5,200 per year × 10.6748△	$55,500□
Second 25 years @ $7,600 per year × 1.559	11,800□
(12.2335△ — 10.6748△ = 1.559)	
Add reversion as above	1,700
Value of leased fee interest	$69,000□

♦ Appendix B, Tables, Columns 4 and 5.
◊ See Appendix B, 8% Table, Column 5.
▲ See Appendix B, 8% Table, Column 4.
△ Appendix B, 8% Table, Column 5.
□ Rounded to nearest 00.

Despite the same average annual rental over the term of the lease, a lower valuation reflects the fact that the level of rentals in the early years has a greater impact upon discounted present worth than do the rental levels of later years.

Advance Rentals

The Inwood table assumes equal amounts, payable *at the end of the year.*

The following demonstrates application of the Inwood annuity table when the payments are to be made in advance, on January 2, instead of December 31. The lessor can immediately reinvest the money, at least theoretically.

Assume that a lessor is to receive a rental of $6,400 per year, for 20 years at 8% interest, with a reversion of $80,000. Rents are payable in advance.

	Present Worth
Step 1	
Receipt of $6,400 at beginning of first year	$ 6,400
Step 2	
Receipt of 19 more payments, corresponding in time to a 19-year annuity at 8%, factor 9.6036* × $6,400	61,460
Step 3	
Reversion $80,000 to be received in 20 years, discounted at 8%, factor .2145†	17,160
Total, based on rentals to be received in advance	$85,000§

* Appendix B, 8% Table, Column 5, 19 years.
† Appendix B, 8% Table, Column 4, 20 years.
§ Rounded to closest 000.

Another way to compute advance rental problems is to add 1.000 to the factor for one less year. This, in effect, is what was accomplished above in Steps 1 and 2. For a 20-year income, payable in advance, the 19-year factor plus 1 = 10.6036 which, multiplied by $6,400, produces the same present value as Steps 1 and 2.

In actual practice, long-term rentals are paid monthly or quarterly, seldom at the end of the year. Technically, rentals paid semi-annually, quarterly, or monthly should be processed by using semi-annual, quarterly, or monthly tables.‡ Practically, income is accounted at the end of the year, and a time lag is bound to occur between receipt of funds and their reinvestment. Therefore, even if the rental were received monthly or quarterly, the tendency is to consider the income as if received once a year, and at the end of the year.

Possessory Interests

The term, possessory interest, may be defined as the right to the occupancy and use of any benefit in the transferred property, granted under any lease, permit, license, concession, or other type of contract. In order to avoid confusion regarding the values of possessory interests, as commonly used,★ it is necessary to clarify whose interest is being appraised.

The value of a possessory interest usually refers to the value of the interest leased, i.e., the value of the use and occupancy of the property for the lease term. This cannot be confused with the value of the lessee's leasehold interest in his right of possession under the terms of his occupancy contract, which is subject to

‡ An example of such semi-annual, quarterly, and monthly tables for 8% appears in Appendix B, Column 5.

★ The concept of the possessory interest, as presently used by certain ad valorem tax jurisdictions, is that the property leased by a tax-exempt government entity to a non-tax-exempt lessee should be valued for tax assessment purposes at the value of the *use* for the term of the lease. This is usually calculated as the value of the property leased less the value of the reversion to the lessor.

Originally most assessing officials followed recognized appraisal procedure in assessing leasehold interests in tax exempt property. If the lease rental equaled the current market rental, no valuation was indicated for the lessee's interest, and there was no assessable value in the leasehold. There was a major change in California assessment procedure in 1955, following a decision of the Supreme Court of the State of California (DeLuz Homes *vs.* County of San Diego, 45 Cal 2d 546). The effect of this decision on leases entered into after 1955 was to depart from the recognized appraisal methods for valuing leasehold interests to a new concept of identifying the entire interest of the lessor, except the reversion, as the value of the lessee's possessory interest; however even under this concept, the total *value* of possessory interest and reversionary interest should not exceed the value of the property if unleased.

his obligation to pay the rent and to comply with the other terms of the lease.

The usual measure of value, recognized by the courts, of a lessee's interest in a lease is the present worth of the difference between the actual rental value of the property leased and the amount of the contract rental that the lessee must pay under the terms of the lease, plus the value of any leasehold improvements owned by the lessee.

The commonly recognized measure of value of the lessor's interest in a leased property is the present worth of the remaining rental payments set forth in the lease until the lease expiration, plus the present worth of the value of the real estate reverting to the lessor.

While the lessee has both a possessory interest and a leasehold interest under any particular lease, the value to the lessee of these two interests may not be the same.

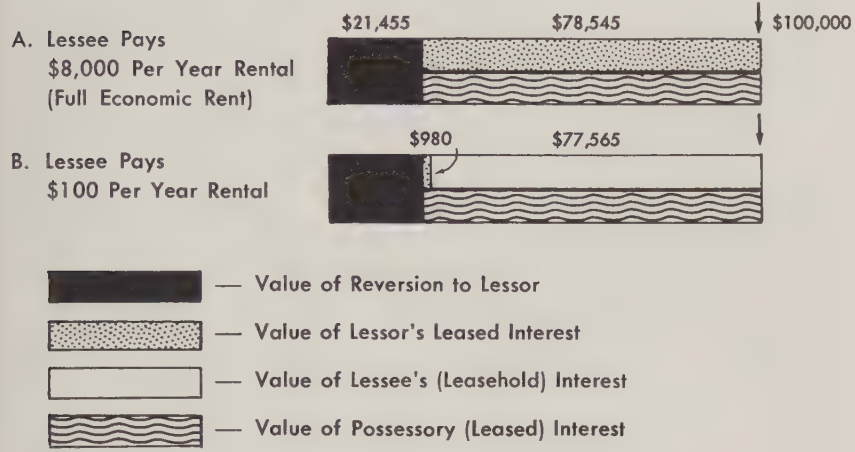
For example, assume a value of $100,000 for land leased for 20 years at its full present rental value of $8,000 per year (which value rests in the lessor). The values of the lessor's interest, the leasehold interests, and possessory interest, are shown in Example A. In this case the lessee's interest has no calculable value. However, the possessory interest of the lessee is defined as the value of the interest which he leases, or $78,545, excluding the reversion in which he has no possessory interest.

EXAMPLE A

Present value to lessor of reversion of the property in 20 years	
$100,000 × .21454▲	$ 21,455♦
Present value to lessor of 20 years' rental to be paid	
$8,000 × 9.818△	78,545◊
Total property value	$100,000

Now assume the same property is leased at a rental of $100 per year, as shown in Example B. Under this situation the value of the possessory interest remains the same as in Example A but the value of the lessor's interest is greatly decreased, and a valuable leasehold has resulted for the lessee.

VALUATION OF LEASEHOLD AND POSSESSORY INTEREST COMPARED



EXAMPLE B

Present value to lessor of reversion of the property in 20 years, as above	$ 21,455♦
Present value of 20 years' rental to be paid to lessor under lease $100.00 × 9.818△	980◊
Present value of difference between economic rent and contract rent ($8,000 minus $100 equals $7,900 per year times 9.818△) is the value of the lessee's interest	77,565◊
Total property value	$100,000

▲ See Appendix B, 8% Table, Column 4.
♦ Retained by lessor and not under control of lessee.
△ See Appendix B, 8% Table, Column 5.
◊ Also value of possessory interest.

In Example A, $78,545 is the value of the possessory interest *leased* to the lessee. Although under *possession* by the lessee, it is a value asset only to the lessor and not to the lessee; and in no

way can the value of the possessory interest be construed as a value of the lessee's interest.

Example B shows the reverse situation, where the lessee is paying such a low rental that practically the entire value of the leased interest is vested in him.

In Example A, the value of the lessee's interest is zero, but in Example B it is actually $77,565. Nevertheless, in both A and B, according to the accepted concept of the value of possessory interests (meaning the value of the *leased* interest belonging to the lessor), its value could be calculated as $78,545. Therefore in accordance with this concept, value of this possessory interest inures to the *lessor* and does not reflect the value of the *lessee's leasehold interest.*

In consequence, an appraisal of the value of the interest of the *lessee* in the property—be it called leasehold interest or possessory interest—can only be obtained by the procedures for valuing leasehold interest, as explained elsewhere in this text, and can arise only when the economic rent exceeds the contract rent.

Summary

The value of various types of partial interests in real property requires appraisal.

The private ownership of any parcel of real estate is comprised of a bundle of rights which may be individually transferred to different ownerships. Such rights or partial interests may involve undivided fractional interests, or the transfer of certain rights of use of the physical property by lease, permit, easement, or other device. Partial interests in property may also be established through land trusts and various forms of partnership.

The physical property may be divided not only horizontally (lots, blocks), but also vertically (air or subsurface rights). Easements for use and access may also be established both horizontally and vertically. Condominium agreements divide a single property into a number of individual ownerships by means of three-dimensional subdivisions.

Leased fees, leaseholds and possessory interests, and easements are divisions of use, possession, or rental of a single property, between a fee owner and a lessee or licensee. The value of these ownerships varies with the contract rental and the economic rental value of the property as well as with the agreements creating them.

It is not the purpose of this chapter to convey the idea that the appraisal of the value of partial interests in real estate is purely a mathematical process, or to deal with the legal aspects of partial interests. The objective is to emphasize the needs for familiarity with the terms of the documents and the programs by which the partial interests are created, and to present orderly processes, involving simple mathematics, as useful tools for the appraisal of such interests. As shown in the examples, the appraiser may begin his appraisal of a partial interest in a particular property with the value of the entire property free and clear. He may then divide this value between the various interests. The assumption is that the total of these various interests tends to be neither greater nor less than the value of the property free and clear. It is recognized, however, that special conditions brought about by the division of a real property into various interests may increase or reduce its earning power, for as long as these various separate interests exist. The procedures presented are to assist the appraiser to make—after analysis—appropriate valuations of the affected interests.

CHAPTER TWENTY-THREE

Rehabilitation, Modernization, and Remodeling

The terms, rehabilitation, modernization, and remodeling, often are used as if they were synonymous, whereas each term has a definite, specific meaning. The following definitions state the distinctions between these terms:

> REHABILITATION—The restoration of a property to satisfactory condition without changing the plan, form, or style of a structure. In urban renewal, the restoration to good condition of deteriorated structures, neighborhoods and public facilities. . . .*
> MODERNIZATION—The term means taking corrective measures to bring a property into conformity with changes in style, whether exterior or interior. It requires replacing parts of the structure or mechanical equipment with modern replacements of the same kind. . . .†
> REMODELING—Changing the plan, form, or style of a structure to correct functional or economic deficiencies.‡

The collective changes arising from rehabilitation, modernization, and remodeling may be grouped under the general heading of renovation.

Rehabilitation

In working with investment properties that have reached middle age, and sometimes with newer properties, the appraiser often

* American Institute of Real Estate Appraisers. *Appraisal Terminology and Handbook* (Chicago: Author, 1967), p. 165.
† *Op. cit.*, p. 137.
‡ *Op. cit.*, p. 166.

finds that expenditures are necessary to bring the property up to a competitive level. When he inspects the improvements, the appraiser examines the need for painting, tuck pointing, carpentry repairs, roof repairs, decoration of rentable or public space; the condition of fixtures, piping, and other equipment; and similar items. Then, in analyzing accrued depreciation, allowance is made for the cost of rehabilitating the property to satisfactory condition. This competitive standard of condition could be at a lower level in an old building than that required of a new building. All curable deterioration is not necessarily rehabilitation, since all curable defects included in the curable physical depreciation category do not require immediate attention. Items which properly come under the heading of rehabilitation are commonly referred to as items of deferred maintenance.

Modernization

Modernization implies replacements or remodeling specifically designed to offset the effect of obsolescence, or additions necessary to meet standards of current demand. The replacement of old radiators, lighting or plumbing fixtures with new items of fundamentally the same type is nothing more than improving the *condition* of the old installation. However, the substitution of convectors for cast-iron radiators, of built-in bathtubs for tubs on legs, or of modern lighting fixtures for old-fashioned types, would not necessarily have any relation to the physical condition of the replaced items, and therefore constitute an improvement of the property. These expenditures offset obsolescence, and may be classed as modernization. Modernization may cost more than simple renewal, but can be economically justified where it offsets the obsolescence inherent in the older type of equipment.

Modernization and simple renewals differ in their effects on the value estimate. Although rehabilitation through renewals may result in sustaining or increasing tenancy and income, and reducing operating costs, these effects may be temporary. In contrast, modernization usually has the additional basic effect of extending

economic life. This could raise the property to a competitive level closer to that which it held when nearly new.

This need for modernization is recognized when items are discovered which are subject to curable functional obsolescence. The corrective action may involve additions to the structure or to the equipment, or it may take the form of changes to the existing structure or equipment.

Changes in layout made to obtain or satisfy tenants may be temporary or permanent in character. Temporary changes are usually referred to as alterations, whereas the more lasting changes, which involve a revised program of use and added value, constitute remodeling.

Alterations, in this context, add to value only indirectly through extending and preserving lease rents. In major properties, such changes are frequent, and office space which is subdivided this year may be changed again in two or three years. Such changes are not considered to have a permanent effect on the structure.

In order to be justified, a modernization program must be economically feasible. It should be initiated only after a feasibility study, with the modernization program related to a soundly conceived plan of operation for the property as a whole.

Remodeling

Remodeling becomes a practical consideration when the present use of a structure is not its highest and best use, and it is necessary to embark on a program involving extensive changes in the property to achieve the desired usage. Functional and economic obsolescence usually are underlying motives for a remodeling program. Examples of the effects of these two causes are found in all cities where large, old buildings no longer physically or economically serve the purpose for which they were built; but, through remodeling programs they have retained their original or attained a new highest and best use.

As in modernization, considerable remodeling may be undertaken which is neither necessary nor practical. Any program for

remodeling must be analyzed carefully to ascertain whether the results achieved can be economically justified. For example, remodeling the attic space in a residence to provide an apartment may not increase the value of the property in proportion to the cost of the remodeling. If done without obtaining the necessary building permit, remodeling may result in health or safety ordinance violations. Expenditures for such remodeling in any type of structure may not be proportionately reflected in increased value.

Costs

General standards of cost data for rehabilitation or renovation are developed through experience and research. Unit-in-place costs for new work, plus an additional allowance for the normally higher cost of repair work, aid in making renovation estimates. Rehabilitation estimates may frequently be based upon actual recent costs for the same or equivalent work performed in the property or in similar properties. Management records may even include bids for specific rehabilitation items which have not been performed, such as exterior painting, roof repair, or interior decorating items.

The cost of some rehabilitation work may approximate that for similar work in new construction. However, the cost of modernization or remodeling work is almost invariably higher than that for new construction, for several reasons. Although the quantity of material may be the same as for new work, more labor is involved, and the conditions are different. The alteration of a structure generally involves tearing out old work and performing small quantities of new work under conditions not conducive to the degree of efficiency attainable on new construction. If the estimate made by the contractor is on a flat fee basis, he may charge substantially more than the cost of identical work in new construction in order to protect himself against complications which may develop as the remodeling progresses. Such complications might involve the unforeseen placement of existing conduits, pipes, and structural load-bearing members.

Other costs to be considered are those which may be incurred by the owner rather than the contractor. These include such items as architect's fee, owner's cost of supervision, and loss of rents due to vacancies while the work is being done. These costs are in addition to the direct cost estimate.

Controlling Principles

Renovation surveys and estimates are controlled primarily by the following principles:[§]

1. Contribution
2. Increasing and decreasing returns
3. Conformity.

According to the principle of contribution, each component of a building should contribute to the production of income or to the value of the whole. For example, if elevators or air-conditioning systems are to be installed in an existing building, their installation should improve (preserve or increase) the net income before recapture to an extent sufficient to amortize and pay a proper return upon the additional investment involved.

Beyond some point, it is almost certain that the net revenue cannot be increased, making it uneconomic to invest more money in the property. A number of computations may be necessary to ascertain this turning point between increasing and decreasing return.

The principle of conformity implies a consideration of the neighborhood. A building may be an improper improvement for the land and the location and, although the design might lend itself well to modernization or remodeling, the rental level which can be achieved in the location may not justify the expenditure involved. Even if the quantity of rent can be increased, its durability may remain questionable.

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§ See chapter on Basic Principles of Real Property Value.

Procedures

Whether rehabilitation, modernization or remodeling are involved, the justification for any renovation program depends upon the answer to the basic question of what constitutes the property's highest and best use. The study that the appraiser gives to this question produces the cost estimates necessary for a program to achieve this use, and these provide the basis for a decision on its economic justification. If the property is old but in sufficiently sound condition for remodeling, if the district standards and trends are materially higher than the property's present status, and if the prospective income improvement is substantial, a comprehensive program may be feasible. A wide range of potential programs may justify consideration, but there is only one satisfactory way to select a final plan. This is to explore the alternatives, to estimate the cost and potential income benefits, and then be guided by the results of a comparison of the data thus developed.

Assume a four-story apartment building, 40 years old, located in a neighborhood which is still in reasonable demand. There are two apartments per floor, each of seven rooms, renting for $75 per month. The building has been allowed to deteriorate but is structurally sound. Indicated values, before and after remodeling, as derived by the income approach, using the straight capitalization method with straight-line recapture and the building residual technique, may be developed as follows:

ESTIMATED VALUE BEFORE AND AFTER PROPOSED REMODELING OF 40-YEAR-OLD 4-STORY APARTMENT BUILDING

A. Indicated Value "As Is"

Prospective gross annual income, 8 units @ $75 × 12	$ 7,200
Allow for vacancy and loss, 10%	720
Effective gross annual income	$ 6,480

(continued)

Brought forward		$ 6,480
Expense		
Fixed	$ 950	
Operating	1,150	
Repairs and replacements	700	
		2,800
Net before provision for recapture of building investment		$ 3,680
Imputable to land, 8% × $10,000		800
Net to building value		$ 2,880
Capitalized at 13% to include interest and (5%) recapture		22,150
Add land value		10,000
Total indicated value		$32,150
Less allowance for deferred maintenance (considered necessary to maintain present net income level)		1,850
Net indicated value, "as is"		$30,300

B. Indicated Value after Remodeling

Prospective gross annual income, 16 units @ $70 × 12		$13,440
Allow for vacancy and loss, 8%		1,075
Effective gross annual income		$12,365
Expense		
Fixed	$1,625	
Operating	1,450	
Repairs and replacements	900	
		3,975
Net before provision for recapture of building investment		$ 8,390
Imputable to land, 8% × $10,000		800
Net to building value		$ 7,590
Capitalized at 11% to include interest and (3%) recapture		$69,000
Add land value		10,000
Total indicated value		$79,000

It is estimated that the following costs would be incurred for the remodeling:

Rehabilitation		$ 1,850★
Capital Improvements		
Modernization		
Two gas-fired heating boilers	$1,600	
Electric fixtures and wiring	1,500	
8 baths at $250♦	2,000	
8 kitchens at $350♦	2,800	
		7,900
Remodeling		
Partition rearrangement	$8,200	
8 baths at $500◊	4,000	
8 kitchens at $700◊	5,600	
		17,800
Estimated total rehabilitation and remodeling cost		$27,550

★ In both the before and after remodeling situations, it is assumed that deferred maintenance, curable for $1,850, must be cared for to maintain net incomes as projected.

♦ Modernization of existing rooms.

◊ Creating new rooms.

Investigation discloses that the remodeled 3-room suites will each bring $70 per month. Taxes will be increased by $550 and insurance $125. Operating cost will be reduced by reason of the new boilers, but administration, water, and other maintenance, including decorating, repairs, and replacements, will result in a net increase of $500 to produce $3,975 of total expense.

Conclusions as to Feasibility

From the above it may be ascertained whether the proposed program is feasible. In order for the remodeling to be feasible, there should be a profit after all costs including allowance for vacancy during construction, allowance for contingencies, and perhaps even a sale commission. In this case, it might be concluded that 20% to 25% of the "after" value would represent a sufficient incentive.

From the above-indicated before-and-after values and estimated costs, this incentive would appear to be as follows:

Indication of "after" value		$79,000
Indication of "before" value		30,300
Projected value increment		$48,700
Cost of renovation program	$27,550	
Estimated loss of rent during implementation of program	3,240	
Allowance for contingencies	410	
		31,200
Net incentive		$17,500
Net incentive as a percentage of after value		22%

Part of the enhancement in value can be accounted for by the lower building capitalization rate, reflecting an extended economic life projection. To support this projection, a re-examination of neighborhood conditions and trends may be in order.

This project would appear to be profitable to an investor prepared to invest a potential $61,500 ($30,300 "as is" value plus $31,200 in renovation), in order to achieve a $79,000 investment. In this case the margin of anticipated profit is such that there may be some question concerning the advisability of proceeding unless the purchaser were a builder who could do all or part of the work himself. Nevertheless, it appears from this analysis that the net incentive represents 22% of the "after" value.

An owner's existing commitment to the property may place him in a different position from the above. He might decide that the potential $48,700 enhancement in value constituted sufficient justification for undertaking a $31,200 remodeling program. However, the valuation, cost, and before-and-after values should be estimated on the basis of a typical prospective purchaser.

In some cases, where the profit potential due to a rehabilitation, modernizing, and remodeling program is substantial, the "as is" value estimate for the property under appraisal should be modified upward. In many cities, old office and commercial buildings have been purchased at relatively low prices by imaginative investors who have undertaken a program of selective modernization,

sometimes involving new exterior ("skin") treatment and other major expenditures. Modernized and attractive properties thus created have resulted in higher occupancy and increased rentals, thus becoming marketable at levels substantially above the investments involved.

Whether this is practical in any specific situation can only be ascertained upon completion of a before-and-after feasibility analysis. This includes, as above, the potential increase in income, the concurrent possible increase in expense, the difference (if any) in capitalization, and the fair share of the "after" value imputable to entrepreneurial increment.

Summary

In any appraisal of mid-life or older buildings, the possibility of additional value that might be created by a well-advised renovation program should be considered. Rehabilitation costs are normally a simple deduction from the value indicated by the usual approaches to the value estimate, if the final valuation is predicated upon the building being in satisfactory rentable condition. However, modernization and remodeling may create additional net income, prolong economic life, and produce an economic margin of value over and above the cost of the work. The owner should anticipate a substantial profit incentive to him as the entrepreneur to justify undertaking such a renovation program. Certain broad appraisal principles apply. The method for determining whether a property is suited to a renovation program includes estimating value as is, cost of the work, and value after completion. The appraiser then considers whether there is sufficient profit incentive to warrant the indicated cost.

In the final analysis, the appraiser's estimate of a feasible rehabilitation, modernization, or remodeling program is part of his process to arrive at a value estimate for the property. Whether or not the owner actually carries out this program, the value of the property in its existing state may be influenced by its potential for increased income production or utility under a feasible remodeling program.

CHAPTER TWENTY-FOUR

Reconciliation of Value Indications

In arriving at the estimate of the defined value, the final step is the reconciliation of the data and indicated values resulting from application of the three approaches. This step brings together the facts, and fits them into cause-and-effect relationships, leading to a conclusion.

The process of analysis and interpretation is continuous throughout each major step of the entire appraisal: the definition of the problem, the preliminary survey, the data program, and the three approaches (cost, market data, and income). In each of these steps the data must be analyzed and interpreted in order to arrive at a supportable conclusion. Each of the three approaches, if applicable, should conform in general to the indicated opinion of value of the property. In this ideal situation there is no problem involved in reconciling the three approach value estimates.

In actual practice, the assembly, analysis, and interpretation of data within the approaches seldom lead to this ideal situation. Therefore it is necessary to consider the relative merit of each value indication, which involves for each approach a review of:

1. The probable reliability of data used
2. The relative applicability of the approach to the type of property being appraised
3. The relative applicability of the approach in the light of the definition of value sought.

Assuming the value sought is market value, this process of reconciliation would involve weighing each estimate in the light

of its dependability as a reflection of the probable actions of users and investors in the market. For example, under certain conditions, the cost approach may influence a typical user or investor because the land value is well supported, and the new building represents a justifiable economic use. However, the value indication by the cost approach, by itself, may not be as conclusive where accrued depreciation is substantial.

With noninvestment property, the market data approach is generally the most applicable if the data is closely comparable and of a sufficient quantity to establish a pattern. The sales of comparable properties within a narrow price range should indicate a pattern which tends to represent the reactions of typical purchasers in the market. Under these conditions the market data approach usually provides a most significant indication of value. However, the market data approach may require support from the income approach, especially if comparable sales reflecting the reaction of typical users and investors in the market are limited in number.

The value of an office building for which 10-or-more years' operating experience (under good management) is available may be strongly indicated by the income approach, which can be given the major share of the weight because experience discloses that investment considerations (present value of anticipated future income) usually provide the principal motivation for purchase.

Review of the Cost Approach

In the application of the cost approach* the appraiser does five things:

1. Estimates the value of the land, as if vacant.
2. Estimates the cost to reproduce or to replace the basic improvements new.†
3. Estimates, in terms of dollars, the amount of depreciation the structure has suffered by reason of:
   a. Physical deterioration

* See chapter on the Cost Approach.

b. Functional deficiencies†
c. Adverse economic influences.

4. Deducts the total amount of the estimated accrued depreciation from the estimated cost of reproducing the structure new. By the same means, estimates the depreciated reproduction cost of minor structures and land improvements (unless the latter are included in the estimated value of the land).
5. Adds the depreciated current reproduction or replacement cost of the basic improvements and of the minor structures to an estimated value of the land (Step 1), to arrive at a value indication by the cost approach.

The cost approach produces a significant indication of value when:

1. The estimated value of the land is reliable.
2. The reproduction or replacement cost new has been correctly estimated.
3. The physical deterioration, and the functional and economic obsolescence have all been correctly estimated.
4. The building is new or nearly new and is the highest and best use of the site.
5. Physical and functional depreciation are measurable.
6. The applicable market data or income approach does not develop indications at great variance with those of the cost approach.

Review of the Market Data Approach

In applying the market data approach the appraiser does five things:

1. Seeks out similar properties for which pertinent sales, listings, offerings, and/or rental data are available.
2. Ascertains the nature of the conditions of sale, including the price, terms, motivating forces, and its bona fide nature.
3. Analyzes each of the comparable properties' important attributes with the corresponding ones of the property being appraised, under the general divisions of time, location, and other characteristics, including physical and economic.

† The use of replacement cost as opposed to reproduction cost automatically provides for functional deficiency. For the functional deficiency represented by overadequacy, care must be taken in estimating depreciation not to duplicate assigned depreciation resulting from this cause. (See chapter on Depreciation.)

4. Considers the dissimilarities in the characteristics disclosed in Step 3, in terms of their probable effect on the sale price.
5. Formulates, in the light of the comparisons thus made, an opinion of the relative value of the subject property as a whole, or, where appropriate, by applicable units, compared with each of the similar properties.

It is axiomatic that the purpose of analyzing comparable sales is to attain an indication of the value at which the property being appraised would sell, if offered on the market.

The market data approach provides a significant indication of value when:

1. The amount of available market data is adequate
2. The relative advantages and deficiencies of the property being appraised and the comparative sale properties are not too extensive, and have been correctly weighted.

Review of the Income Approach

In applying the income approach the appraiser does seven things:

1. Projects (estimates) the quantity of the prospective effective gross income,‡ after considering:
   a. The record of the actual gross income in previous years and a current rent schedule
   b. Existing leases, their terms and conditions
   c. Market rental rates for comparable space (economic rents)
   d. The potential gross income (economic rent plus services)
   e. The effective gross income (potential, less an allowance for vacancy and credit loss)
   f. The short-term surplus or excess income, if any (segregated for later treatment).
2. Projects (estimates) the quantity of the prospective expenses§ after considering:
   a. The record of actual expenses for previous years
   b. Expense history for other comparable properties by general categories:
      (i) Operating expenses and repairs
      (ii) Fixed expenses
      (iii) Reserves for replacements.
3. By subtraction, computes the expected net income before recapture (provision for anticipated decline in building value).

4. Selects an applicable method or methods of capitalizing the net income:
   a. Over-all capitalization♦
   b. Investor's approach to capitalization♦
   c. Straight capitalization with straight-line recapture♦
   d. Straight capitalization with sinking-fund recapture♦
   e. Annuity capitalization◊ (Inwood)
   f. Mortgage equity.
5. Selects one of the following techniques:▲
   a. Land residual
   b. Building residual
   c. Property residual.
6. Selects or develops a capitalization rate★ which he considers appropriate to the quality and durability of the income.
7. Executes the mathematical calculations necessary to arrive at an indication of value.

The income approach produces a significant indication of value when:

1. Gross income and operating costs have been properly projected.
2. The capitalization rate reflects the market.
3. Appropriate methods and techniques have been used.

Conclusion

Having analyzed the data and obtained indications of the value by the appropriate approach or approaches, the appraiser proceeds to reconcile the value indications into a final conclusion of the defined value.

In its precision, an appraisal depends on his judgment, and applicability of the information on which it is based. It also depends on the knowledge and experience of the appraiser in interpreting the data. All of the pertinent data is analyzed in forming the basis for his opinion.

‡ Chapter on Gross Income Estimates.
§ Chapter on Analysis of Expense.
♦ Chapter on Direct and Straight Capitalization.
◊ Chapter on Annuity Capitalization.
▲ Chapters on Direct and Straight Capitalization, and Annuity Capitalization.
★ Chapter on Interest and Capitalization Rates.

The appraiser uses his judgment particularly in deciding the degree of reliance to be placed on the indications of value that are derived from one or more of the appropriate approaches. The indications of value from the different approaches are never averaged; to do so would be substituting arithmetic for judgment and experience. Accordingly, when using more than one approach, the appraiser must reconcile the value indications, thereby arriving at a conclusion, which in his opinion is the defined value of the property under appraisal.

CHAPTER TWENTY-FIVE

The Appraisal Report

THE FORM, LENGTH, and contents of an appraisal report may vary in different appraisals, depending upon the requirements of the client, the type of property, and the nature of the appraisal assignment. Basically, there are three different kinds of appraisal reports: the certificate or letter, standard form reports, and the narrative report. Regardless of the type or length of the report, the appraiser should adhere to accepted standards of appraisal procedure and reporting.*

Certificate or Letter

A certificate or letter giving the appraiser's opinion of value is not an appraisal report. These usually state only the appraiser's opinion of value, without inclusion of the supporting data, or the analysis and interpretation leading to his conclusion. The instances in which the use of the appraisal letter is acceptable are limited. There may be circumstances when the client desires and specifically requests the appraiser to present his opinion in letter form without including detailed documentation. Usually the appraiser presents his report in the form that the client requests. However, the simplicity of the final form can never preclude the necessity for the appraiser to meet the detailed requirements of a complete appraisal. Although he may report only the opinion, he

* See Appendix A, Regulation 10.

keeps in his permanent file all the material and data as well as all the working papers which he would assemble and process in a complete analysis, interpretation, and conclusion for a narrative report. While the appraiser may not be asked to submit a written substantiation of the opinion he has remitted in abbreviated form, he may be called upon at a later date to explain or defend his opinion.

Form Report

Institutions and governmental agencies frequently find that form appraisal reports best meet their purposes. Inasmuch as such clients handle many appraisals in the course of a single year, a standardized report form may be more efficient and convenient for their purpose. It enables those responsible for reviewing the appraisals to know exactly where in the report to find any particular category or item of data; and completion of the form insures that no item required by the reviewer is overlooked.

If an appraiser finds the report form too rigid with no provision for certain data which he believes to be pertinent, he should add a supplement to incorporate the pertinent information and comments. Since repeated use of a form report tends to become mechanical at the expense of thoughtful analysis, such use is not encouraged except at the request of clients.

Narrative Report

The two kinds of appraisal reports mentioned above are abbreviations or variations of the complete narrative form of report. It is the narrative appraisal report which affords the appraiser the opportunity to support his opinions and conclusions and to convince the reader of the soundness of his estimate. Accordingly, the discussion in this chapter concerning the appraisal report is directed primarily to the complete narrative form.

Every appraisal report is intended to answer a particular value question, and generally is intended to constitute the basis for a decision by the client. Questions may be: What is the market

value? In condemnation, it may be what is the value of the part taken, as part of the whole? What is the damage to the remainder of the property, as the result of the taking? The objective of the appraisal report is, first, to set forth in writing the answers to the questions asked by the client; and second, to substantiate those answers. To achieve this objective and to be of maximum service to the client, the report must not only present the appraiser's conclusions, but also guide a reader to similar conclusions through the adequacy and pertinence of the supporting data, the logic of its interpretation and analysis, and the soundness of the appraiser's reasoning.

In a sense, the appraisal report is a summary of the appraisal methods and techniques which the appraiser has applied to factual material, within the framework of the appraisal process, to arrive at a value conclusion. Such a report reflects the appraiser's understanding of basic economic and appraisal principles, his ability to interpret pertinent data, and his judgment in selecting the appropriate appraisal method and technique, as well as his skill in applying them to derive an estimate of a specifically defined value.

Format

Every report made with the expectation that its conclusions will be accepted should aim to attain maximum communication with a reader who may be the client, or another to whom his report may be submitted. Since readers tend to scan, rather than to study the report, it should be presented in a manner that readily discloses the description of the property, the essential analysis of the problem, and the value conclusion.

A well-prepared report goes beyond thorough research, logic of organization, and soundness of reasoning. These basic attributes are enhanced in presentation by good composition, excellence of style and clarity of expression. The material should be set forth as succinctly as possible, in order to achieve effective communication with the reader while conserving his time. Important to format and appearance are the quality and the assembly of

the materials used, coherence in organization of the facts, arrangement of the supporting data, and the physical presentation.†

Since the appraiser may not be present when his report is reviewed or examined, it becomes his representative—creating a favorable impression of his professional competence, or the reverse.

To attain the appraiser's objective—a superior report—the following points merit close attention:

1. A good grade of paper, cover, and binding should be used. The paper may bear the appraiser's mark or imprint.
2. The report may be typed or printed. In either case, type should be attractive and of size and style affording easy readability. Graphic aids‡ always should be well drawn. Style of main and subheadings should be consistent with subject matter.
3. Other exhibits are usually relegated to an addenda, to avoid interruption of continuity in the narrative body of the report. They are usually most effective when made the same size as the report and tailored to fit.
4. The content of the report should be well presented in appropriate separate sections:
   a. Table of contents and index (if any)
   b. Qualifying and limiting conditions; underlying assumptions (general)
   c. Description of the property, its condition, and environment; this includes underlying assumptions (specific)
   d. Pertinent facts
   e. Reconciliation of value indications.

A detailed outline for an appraisal report with discussion of every section is given in the remainder of this chapter.

Outline of Report

Although appraisal reports vary in content and arrangement, certain elements are common to all. Essentially, the report follows the outline of the appraisal process.

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† A great deal of material which has been published on how to write good reports may be found in sources other than this text. For example, William C. Himstreet, *Writing Appraisal Reports* (monograph, Chicago: American Institute of Real Estate Appraisers, 1971).

‡ Himstreet, *op. cit.*, in Chapter VI discusses the use of graphic aids.

Whether carried through in a flowing manner or arranged by formal sections, there are three major divisions to a report: first, the introduction; second, the description, analysis, and conclusions; and third, the addenda. Within these three divisions, the organization of the report may be varied. The following is typical of good organization.

Part One—Introduction
- Title page. Frontispiece, if any, may face title page§
- Letter of transmittal. May include certification of value.
- Table of contents
- Summary of salient facts and important conclusions

Part Two—Descriptions, Analysis, and Conclusions
- Objective of the appraisal, and definition of value
- Identification of the property, legal description, also underlying assumptions (specific)
- Property rights appraised and date valuation applies
- City data, neighborhood and locational data, and trend
- Land or site data, zoning, utilities and taxes
- History
- Description of improvements
- Highest and best use analysis
- Development of an indication of value by
  - The cost approach
  - The market data approach
  - The income approach
- Reconciliation of value indications and conclusion of value
- Qualifying and limiting conditions. These include underlying assumptions (general).
- Certification of value if not combined with letter of transmittal
- Qualifications of appraiser

Part Three—Addenda
- Maps, plats, photographs §
- Detailed statistical data
- Detailed property data, if too lengthy to be included in Part Two
- Detailed market data, if too lengthy to be included in Part Two
- Leases or lease summaries.

This general outline is illustrative, and the arrangement set forth is flexible and adaptable to almost all appraisal assignments

§ A single photograph of the property or other exhibit may be used as a frontispiece or instead appear in Part Three.

and all classes of real property. In practice, the appraiser adapts it to the particular requirements of the assignment and personal preference.

Letter of Transmittal

The letter of transmittal formally presents the appraisal report to the person for whom the appraisal was made, and should be drafted in compliance with approved practices of business correspondence. It should be as brief as the character and nature of the assignment permits.

The essential elements of a suitable letter of transmittal may include, among other things, the following:

1. Date of letter and salutation
2. Street address of the property involved and a brief description, if necessary
3. Statement as to the interest in the property being appraised
4. Statement that inspection of the property and necessary investigation and analysis were made by the appraiser
5. Reference that the letter is accompanied by a complete appraisal report
6. Date as of which the value estimate applies
7. The value estimate
8. The appraiser's signature.

Although some appraisers prefer to include their certification of value in the letter of transmittal rather than to make it an item in Part Two of the report, it may be a separate page in the report.

Table of Contents

The different components in the report customarily are listed in the table of contents. A well-prepared table of contents will indicate the scope and adequacy of the appraiser's investigations and analyses.

Summary of Important Conclusions

If the appraisal report is long and complicated, it may be desirable to have a statement of the major points and important

conclusions in the report. This provides the reader with a convenient summary and affords the appraiser an opportunity to stress points that he has considered in reaching his final estimate. Among the items which may be discussed in this section are:

1. Estimate of land value and highest and best use
2. Total reproduction and/or replacement cost new of improvements (per square foot and/or cubic foot)
3. Age of improvements and their net depreciated value
4. Gross rental value on a stated occupancy basis
5. Net income expectancy
6. Capitalized value estimate
7. Estimated market price obtainable and unit basis
8. The final estimate of defined value.

All of these items do not apply to all appraisal assignments. The list is illustrative of the character of material usually considered in this part of the report.

The appraiser may use a summary for longer or more complex reports. However, in many appraisal assignments, the summary is omitted, particularly if the letter of transmittal contains some brief discussion of conclusions concerning the more important items.

Objective of Appraisal

This section states the objective of the report. In short or medium-length reports, it could easily be combined with the property identification. In longer reports, or in condemnation work, where the purpose may be multiple, objectives might be described as follows:

1. The market value of the real property as it now exists, before the taking of land for the Innerbelt Freeway
2. The market value of the property after the taking of 87,523 square feet of land and the improvements thereon
3. The market value of the part taken as part of the whole
4. Damage to the remainder after the taking and after completion of the project in the manner proposed.

Exhibit A, a photostat section of a Highway Department drawing, shows the property outlined in green and that section which is to be taken outlined in red.

Or in less complicated situations the appraiser may state simply:

> The objective (or purpose) of this report is to estimate market value as of (a given date).

Identification of Property

The property appraised must be so identified that it cannot be confused with any other parcel of real estate. This can be achieved by giving the full legal description. If a copy of the official plat is used, it should be referred to at this point, and included in the addenda. In the absence of a plat, the property should be described by locating it by name and side of street on which it fronts, as well as by street number and the distance from the nearest cross street. Such a description might read:

> The site, commonly known as 205 North Miami Avenue, consists of the southwest corner of Miami Avenue and N.W. Second Street. It is rectangular in shape with 150-feet frontage on North Miami Avenue and 100-feet frontage on N.W. Second Street. The two-story stucco hotel and store building with which the site is improved is 90 feet by 150 feet. The west 10 feet of the site is a private concrete paved alley.
>
> The legal description of the above-described property is:
>
> Lots One (1) and Two (2), Block 160N., City of Miami, a subdivision of Dade County, State of Florida, as recorded in the public records of Dade County, State of Florida, in Plat Book B at page 41.

Just as it is important to identify the actual property being appraised, it may be equally important to define clearly particular rights or interests. Examples are an assignment involving a partial interest in a property or limited rights such as surface or mineral rights, or the value of the fee subject to a long-term lease, or a leasehold interest.♦

City Data

All the important facts about the city and its surrounding territory which the appraiser has judged pertinent to the specific appraisal problem may be included under city data. The types of data, their appropriate use in relation to the various classes of

♦ See chapter on Valuation of Partial Interests.

property and to specific types of problems, and their degree of influence have been thoroughly discussed in the chapter on Neighborhood Analysis. In making the appraisal, all pertinent factors are considered and weighed, but discussion in the report should be confined to data which was found significant to the problem under consideration. If the data to be used is statistical, the type and importance to the discussion indicate whether it should be included in the report proper or placed in the addenda. Usually, where the appraisal problem involves a considerable amount of supporting data—such as population figures, cost-of-living indices, or payroll figures—these are placed in the addenda and referred to in the report in connection with the conclusions drawn from them. In many reports, no separate section is needed for city data which may be combined with the neighborhood data.

Neighborhood and Location Data. The character of the data to be included in any appraisal report should be related to the objective of the report and the appraiser's conclusion of value. Under this heading, items such as the following may be included:

1. Distance and direction from employment centers
2. Public transportation
3. Road pattern, layout, and width of streets
4. Proximity to good shopping
5. Proximity to grade and other schools
6. Proximity to churches
7. Proximity to parks and recreation
8. Proximity to nuisances
9. Police and fire protection, rubbish collection
10. Life stage of neighborhood
11. Population trend
12. Prevailing nationalities, infiltration
13. Percentage of homeownership
14. Vocations, wage levels, rent levels
15. Conformity of development
16. Vacancy of living or store units
17. Prestige and/or pride of ownership
18. Restrictions and zoning
19. New construction activity
20. Percentage of vacant land

21. Encroachment, changing use
22. Level of taxes
23. Adequacy of utilities and street improvements
24. Adequacy of parking, street and off-street
25. Concentration of advertising by retail merchants
26. Street traffic, type and amount
27. Pedestrian traffic, type and amount
28. Proximity to expressways, tollroads and airports
29. Rail connections and service for freight
30. Labor supply, quantity, and type
31. Adjacent owners
32. Availability of financing—attitude of lenders.

As in other sections of the report, the extent of neighborhood and location data depends upon circumstances. For example, if the appraisal were being made for an out-of-town client, unfamiliar with the property or even the community, it may be desirable to include more community and neighborhood data than that necessary for a local client. In the case of an important business property where the income is derived from the purchasing power of the entire supporting area, it is important to have the most detailed description of that neighborhood and the influence of the population and its purchasing power on the value of the property being appraised.

City and neighborhood data represent the background against which the property under appraisal is considered, and they acquire significance in proportion to the extent that they affect the value of this property. Hence these sections in an appraisal are incomplete without some analysis of trends indicated by the data, and some conclusion reached by the appraiser. This conclusion reflects application of the appraiser's professional experience and judgment to an interpretation of the data presented in terms of its meaning to the future marketability or economic life expectancy of the property being appraised.

Zoning and Taxes. The inclusion of zoning data is optional in the neighborhood section. Where important, the zoning and private restrictions should be discussed in detail. If the ordinance itself is included, the text may be reproduced in the addenda.

When not included, sufficient data should be provided for a reader to identify the limitations which zoning places on the use or development of the site.

The appraiser also should point out existing public, deed, and private restrictions and their effect on utility and value of the property. Both assessed values and amount and trend of ad valorem real estate taxes—existing and prospective—should be analyzed and discussed, where pertinent.

Site Description and Value

In this section of the report belong those factors which the appraiser judges pertinent to his problem, all of which have been discussed in detail in earlier chapters. Among these items are:

1. Description of the site, area, shape, contour, soil and subsoil; utilities
2. Highest and best use
3. Land valuation on a unit basis.

If the appraiser's estimate of the value of the property is based upon a suggested program to achieve a particular highest and best use, the report should clearly state this fact, and that the estimate of value does not apply unless the future use of the property will be in accordance with the program proposed. If for some reason the property cannot be thus adapted and used, the report should so indicate, and state what utilization does underlie the appraiser's value estimate. The character and amount of data presented and analyzed depends upon the objective of the appraisal.

Description of Improvements

In this section the appraiser includes and discusses all building and improvement data relevant to the appraisal problem. Whereas in making the appraisal he considers and processes a large amount of data, he sets forth in his report only the significant factors and elements which influenced his conclusions. These include:

1. Structural and construction detail
2. Mechanical equipment
3. Number and size of units
4. Age and size of building
5. General condition
6. Discussion of functional inutility.

Presentation of this information may be supplemented through the use of drawings, photographs, floor plans, and elevations. If not highly pertinent, this illustrative material should be placed in the addenda with other supplementary matter. If the structural and mechanical detail given in the report involves many pages, only an outline with emphasis on the important items may be given in the body of the report.

Approaches to Value

This section brings together the indications of value that the appraiser has obtained under one or more of the three approaches, together with the analysis, interpretation, and reconciliation, which lead to his conclusion.

Because many clients may not be familiar with the mechanics of the three approaches, the appraiser may explain his procedures in the development of his data, as may appear advisable in the circumstances of the case. Simple statements of what is included in each of the three approaches help the reader to understand what is to follow.

Assume an appraisal is being made of the value of a property, calling for employment of the basic three approaches to value (the cost approach, the income approach, and the market data approach). In presenting the cost approach, the appraiser gives his estimated reproduction or replacement cost (new) of the building and land improvements; and the amount subtracted together with his reasons for deducting for depreciation resulting from wear and tear, design and plan, and neighborhood defects. To this depreciated building cost estimate he adds his estimated

value of the land. The total shows the value indicated by the cost approach.

In presenting the market data approach, the appraiser compares the subject property with similar properties that have been sold recently. Sales of generally comparable buildings are used, and adjustments are made to demonstrate a probable price at which the subject property would sell if offered on the market, as explained in detail earlier in this text. This material should be presented in an orderly way, so as to lead to a logical indication of value.

In presenting the income approach, the appraiser shows the present rental value, deducts for vacancy and other expense, and gives his conclusion as to the prospective net income of the property. In support of his net income estimate, he may discuss the operating statements for previous years, together with available experience operating-cost estimates, as discussed earlier in this text. Then he shows his capitalization process and his selected interest and capitalization rates, together with his reasoning in selecting them, finally arriving at an indication of value through the income approach.

Reconciliation and Conclusion of Value

A sound principle to follow in the preparation of an appraisal report is to keep description separate from analysis and interpretation. This means that factual and descriptive data is limited to those sections of the report where they may logically be presented as such. Analysis and interpretation then include references to, and the evaluation of, those facts in terms of their influence on the final value estimate.

The analysis, interpretation, and reconciliation of the value indications, under the one or more pertinent approaches applied in the appraisal should lead logically to the appraiser's statement of his final estimate of value, defined in terms pertinent to the objective of the appraisal assignment. The concluding statement of the final estimate of value may be presented in many ways. The following is a simple example:

As a result of my investigation and my general experience, it is my opinion that the market value of this property, as of July 20, 19—,◊ was

FOUR HUNDRED THOUSAND DOLLARS

When the value conclusion is divided, the appraiser may add after the amount:

... which may be allocated as follows:

Land	$ 80,000
Building	320,000
Total	$400,000

Certification of Value

A certification of value states that the appraiser, in his professional capacity, personally conducted the appraisal in an objective manner. It should include statements that he personally inspected the property and considered necessary value factors in forming his opinion, that he has no present or contemplated interest in the property, and that he conducted the appraisal in conformity with the ethics of the appraisal profession, with which he is thoroughly familiar if he is a member of the American Institute of Real Estate Appraisers.▲ The certification should state also that the appraiser's fee was not contingent on the value reported, and that the data included in the report is correct to the best of his knowledge.△

Whether included in the transmittal letter or a separate signed page, the appraiser's certification is a highly important part of the appraisal report because it permits him to state his precise position, protecting his integrity and the validity of his appraisal.

A frequently used form of certification is the following: □

The undersigned appraiser certifies that he has personally inspected the property described herein, located at 5525 Wilshire

◊ Date as of which the value opinion applies may differ from that of the letter of transmittal.

▲ Standards are defined in Regulation 10 of the American Institute of Real Estate Appraisers.

△ William C. Himstreet, *Writing Appraisal Reports* (Chicago: American Institute of Real Estate Appraisers, 1971), pp. 20–21.

□ Himstreet, *loc. cit.*

Boulevard, Los Angeles, California; that he has no past, present or prospective, direct or indirect interest in the said property or the use of this appraisal; that his employment in this appraisal is not in any manner contingent upon returning appraisal findings in any specified or implied amount or otherwise contingent upon anything else other than the delivery of this report; that, to the best of his knowledge and belief, all of the statements and opinions contained in this report are correct; and, that this appraisal has been made in conformity with . . . [here are cited standards* of professional conduct, and their source].

Respectfully submitted,
(signature)

(date)

* The appropriate phrase for M.A.I.'s and candidates for membership in the American Institute of Real Estate Appraisers is ". . . in conformity with the Professional Standards of the American Institute of Real Estate Appraisers." For details of this Institute's Code of Ethics, see Appendix A.

Underlying Assumptions and Limiting Conditions

These qualifying assumptions and conditions may be stated in the letter of transmittal, or included as a separate page. Although they are negative statements, used for the appraiser's protection and for the information and protection of the client and others using the report, appropriate contingent and limiting conditions are an important part of the report and should be set forth clearly. Included may be such items as the following:

This Appraisal is Subject to the Following Underlying Assumptions and Qualifying and Limiting Conditions:

This appraisal covers the property as described in this report, and the areas and dimensions as shown herein are assumed to be correct.

The appraiser has made no survey of the property and assumes no responsibility in connection with such matters. Any sketch or identified survey of the property included in this report is only for the purpose of assisting the reader to visualize the property.

Responsible ownership and competent management are assumed.

No responsibility is assumed for matters involving legal or title considerations.

The information identified in this report as being furnished by others is believed to be reliable, but no responsibility for its accuracy is assumed.

Possession of this report, or a copy thereof, does not carry with it the right of publication, nor may it be used for any purpose by any but the client for whom it was made without the consent of the appraiser or the client.

The appraiser is not required to give testimony or attendance in court by reason of this appraisal unless arrangements have been previously made therefor.

The allocation of total value to land or to buildings, as shown in this report, is invalidated if used separately in conjunction with any other appraisal.

Qualifications of the Appraiser

A statement of the diversified qualifications of the appraiser usually is included in the appraisal report as evidence that he is qualified to make such an appraisal. His qualifications should be classified in some orderly form, which includes facts concerning:

Professional experience
Educational background and training
Business, professional, and academic affiliations and activities.

To this may be added a list of the clients for whom the appraiser has rendered professional services and the types of properties that he has appraised, as well as the nature of the appraisal assignments he has executed.

The use of such statements has become so general that many appraisers have found it expedient to prepare a printed statement of their qualifications, for insertion in each specially prepared appraisal report.

Addenda

Depending on the size and complexity of an appraisal assignment, an addenda may be used in order to avoid interrupting the narrative portions of the report. To this end, data such as the following may be included in the addenda:

Plot plan
Plans and elevations of buildings
Photographs of properties referred to in the report

City, neighborhood, and other maps, with data
Charts and graphs
Abstracts of leases
Historical income and expense data
Specifications of buildings
Detailed estimates of reproduction costs of buildings
Sales and listing data
Tax and assessment data.

Summary

The form, length, and contents of an appraisal report may vary. A certificate or letter reporting only the appraiser's opinion is limited, and if used should always be supplemented by complete supporting data kept in the appraiser's file.

Use of standardized form reports by appraisers is not encouraged, unless requested by institutional or government clients. If space on the client's form is inadequate, the appraiser should add as a supplement important pertinent data and his comments.

A detailed narrative appraisal report is a written document which usually contains, among other things:

1. A clear and unequivocal description of the real estate, and identification of the entire fee simple estate or fractional interest being appraised
2. The nature and objective of the appraisal assignment, including pertinent facts and underlying specific assumptions considered and made by the appraiser
3. The qualifying and limiting conditions. These include underlying general assumptions, not to be confused with the specific assumptions, above.
4. Pertinent factual data, together with an analysis and interpretation of its significance
5. The processing of the data by one or more of the three approaches
6. The date as of which the value is estimated
7. The estimate of defined value
8. The certification and signature of the appraiser
9. A factually accurate statement of the appraiser's qualifications
10. Addenda: Other descriptive material and exhibits, including maps, plans, charts, and photographs
11. A table of contents with a page number for each item listed.

An appraisal report is written to portray the property, the facts concerning that property, and the reasoning by which the appraiser has developed his estimate of defined value. This *estimate* is the appraiser's opinion, reflecting consideration of all of the data in the light of his experience and judgment, whereas only courts and legally constituted authorities *determine* value.

Being an answer to a question by a client, every report should state the problem, or a definition of the value sought, and set forth the facts considered, clearly outlining the reasoning employed by the appraiser in developing his conclusions.

Whether the report is brief or voluminous, the same steps appear, and the extent of consideration given to each depends upon the character and complexity of the problem. These steps include stating that the appraiser made an appraisal, defining the objective of the appraisal assignment, setting forth what he did, describing the property, and then presenting his reasoning, his conclusion, and underlying assumptions together with the qualifying and limiting conditions. The report should be a systematic and orderly presentation which, with the physical appearance of his report, constitute a gauge of the appraiser's professional ability.

The best report is the one which, in the fewest words, enables the reader to understand the problem and the factual data, and then to follow readily the appraiser's reasoning from these facts to his conclusion.

Appendix A

Code of Ethics

AMERICAN INSTITUTE OF REAL ESTATE APPRAISERS
OF THE
NATIONAL ASSOCIATION OF REAL ESTATE BOARDS

Code of Ethics

Canon 1

A Member of the Institute must refrain from conduct that is detrimental to the real estate appraisal profession.

Canon 2

A Member of the Institute must assist the Institute in carrying out its responsibilities to the public and to the other Members of the Institute.

Canon 3

When performing a real estate appraisal assignment, a Member of the Institute must render his professional services without advocacy for his client's interests or the accommodation of his own interests.

Canon 4

In rendering professional real estate appraisal services, a Member of the Institute must perform competently at all times.

Canon 5

In making written and oral real estate appraisal reports, a Member of the Institute must comply with the rules of the Institute relating to the contents of such reports.

(continued)

Canon 6

A Member of the Institute must not violate the confidential nature of the appraiser-client relationship by improperly disclosing the confidential portions of a real estate appraisal report.

Canon 7

A Member of the Institute must refrain from unprofessional conduct in securing real estate appraisal assignments and in using advertising media in connection with his real estate appraisal practice.

The full text is published in a monograph, *Regulation No. 10, Code of Professional Ethics and Standards of Professional Conduct,* by the American Institute of Real Estate Appraisers, Chicago. The essence of Regulation No. 10 appears in the seven Canons, above.

Appendix B

Compound Interest Tables

The Tables

Every computation of compound interest is made on the basis of a selected time period, which may be a year, a half-year, a quarter, or a month.

All the figures in these tables are for exactly one unit. If this unit is one dollar, any number of dollars can be multiplied by the figure shown in the table, in order to obtain the result. The basic construction of these tables is shown in the formulae at the base of the six columns, and is explained in the chapter on Annuity Capitalization.

The principal function of the following tables is illustrative. Therefore Appendix B includes only 3% through 12% by ¼%, and 13% through 30% by 1%, annual figures. In addition, the 8% tables include monthly, quarterly, and semi-annual figures.

More comprehensive tables, showing a greater range of rates, periods, and compounding frequencies, may be found in books of tables, such as: two books by Charles B. Akerson, M.A.I., *Introduction to Mortgage Equity Capitalization* (2d ed. Chicago: American Institute of Real Estate Appraisers, 1973); *Capitalization Theory and Techniques, Study Guide, Course I–B* (Chicago: American Institute of Real Estate Appraisers, 1973); L. W. Ellwood, M.A.I., *Ellwood Tables for Real Estate Appraising and Financing, Part II,* (3rd ed. Chicago: American Institute of Real Estate Appraisers, 1970); Financial Publishing Company, *Financial Compound Interest and Annuity Tables* (3rd ed. Boston: Author, 1961).

The following tables were specially prepared for this text by the Financial Publishing Company of Boston.

YEARS	1 AMOUNT OF ONE	2 AMOUNT OF ONE PER PERIOD	3 SINKING FUND FACTOR	4 PRESENT WORTH OF ONE	5 PRESENT WORTH ONE PER PERIOD	6 PARTIAL PAYMENT
1	1.030 000	1.000 000	1.000 000	.970 874	.970 874	1.030 000
2	1.060 900	2.030 000	.492 611	.942 596	1.913 470	.522 611
3	1.092 727	3.090 900	.323 530	.915 142	2.828 611	.353 530
4	1.125 509	4.183 627	.239 027	.888 487	3.717 098	.269 027
5	1.159 274	5.309 136	.188 355	.862 609	4.579 707	.218 355
6	1.194 052	6.468 410	.154 598	.837 484	5.417 191	.184 598
7	1.229 874	7.662 462	.130 506	.813 092	6.230 283	.160 506
8	1.266 770	8.892 336	.112 456	.789 409	7.019 692	.142 456
9	1.304 773	10.159 106	.098 434	.766 417	7.786 109	.128 434
10	1.343 916	11.463 879	.087 231	.744 094	8.530 203	.117 231
11	1.384 234	12.807 796	.078 077	.722 421	9.252 624	.108 077
12	1.425 761	14.192 030	.070 462	.701 380	9.954 004	.100 462
13	1.468 534	15.617 790	.064 030	.680 951	10.634 955	.094 030
14	1.512 590	17.086 324	.058 526	.661 118	11.296 073	.088 526
15	1.557 967	18.598 914	.053 767	.641 862	11.937 935	.083 767
16	1.604 706	20.156 881	.049 611	.623 167	12.561 102	.079 611
17	1.652 848	21.761 588	.045 953	.605 016	13.166 118	.075 953
18	1.702 433	23.414 435	.042 709	.587 395	13.753 513	.072 709
19	1.753 506	25.116 868	.039 814	.570 286	14.323 799	.069 814
20	1.806 111	26.870 374	.037 216	.553 676	14.877 475	.067 216
21	1.860 295	28.676 486	.034 872	.537 549	15.415 024	.064 872
22	1.916 103	30.536 780	.032 747	.521 893	15.936 917	.062 747
23	1.973 587	32.452 884	.030 814	.506 692	16.443 608	.060 814
24	2.032 794	34.426 470	.029 047	.491 934	16.935 542	.059 047
25	2.093 778	36.459 264	.027 428	.477 606	17.413 148	.057 428
26	2.156 591	38.553 042	.025 938	.463 695	17.876 842	.055 938
27	2.221 289	40.709 634	.024 564	.450 189	18.327 031	.054 564
28	2.287 928	42.930 923	.023 293	.437 077	18.764 108	.053 293
29	2.356 566	45.218 850	.022 115	.424 346	19.188 455	.052 115
30	2.427 262	47.575 416	.021 019	.411 987	19.600 441	.051 019
31	2.500 080	50.002 678	.019 999	.399 987	20.000 428	.049 999
32	2.575 083	52.502 759	.019 047	.388 337	20.388 766	.049 047
33	2.652 335	55.077 841	.018 156	.377 026	20.765 792	.048 156
34	2.731 905	57.730 177	.017 322	.366 045	21.131 837	.047 322
35	2.813 862	60.462 082	.016 539	.355 383	21.487 220	.046 539
36	2.898 278	63.275 944	.015 804	.345 032	21.832 252	.045 804
37	2.985 227	66.174 223	.015 112	.334 983	22.167 235	.045 112
38	3.074 783	69.159 449	.014 459	.325 226	22.492 462	.044 459
39	3.167 027	72.234 233	.013 844	.315 754	22.808 215	.043 844
40	3.262 038	75.401 260	.013 262	.306 557	23.114 772	.043 262
41	3.359 899	78.663 298	.012 712	.297 628	23.412 400	.042 712
42	3.460 696	82.023 196	.012 192	.288 959	23.701 359	.042 192
43	3.564 517	85.483 892	.011 698	.280 543	23.981 902	.041 698
44	3.671 452	89.048 409	.011 230	.272 372	24.254 274	.041 230
45	3.781 596	92.719 861	.010 785	.264 439	24.518 713	.040 785
46	3.895 044	96.501 457	.010 363	.256 737	24.775 449	.040 363
47	4.011 895	100.396 501	.009 961	.249 259	25.024 708	.039 961
48	4.132 252	104.408 396	.009 578	.241 999	25.266 707	.039 578
49	4.256 219	108.540 648	.009 213	.234 950	25.501 657	.039 213
50	4.383 906	112.796 867	.008 865	.228 107	25.729 764	.038 865
51	4.515 423	117.180 773	.008 534	.221 463	25.951 227	.038 534
52	4.650 886	121.696 197	.008 217	.215 013	26.166 240	.038 217
53	4.790 412	126.347 082	.007 915	.208 750	26.374 990	.037 915
54	4.934 125	131.137 495	.007 626	.202 670	26.577 660	.037 626
55	5.082 149	136.071 620	.007 349	.196 767	26.774 428	.037 349
56	5.234 613	141.153 768	.007 084	.191 036	26.965 464	.037 084
57	5.391 651	146.388 381	.006 831	.185 472	27.150 936	.036 831
58	5.553 401	151.780 033	.006 588	.180 070	27.331 005	.036 588
59	5.720 003	157.333 434	.006 356	.174 825	27.505 831	.036 356
60	5.891 603	163.053 437	.006 133	.169 733	27.675 564	.036 133
	$S^n = (1+i)^n$	$S_{\overline{n}|} = \frac{S^n - 1}{i}$	$1/S_{\overline{n}|} = \frac{i}{S^n - 1}$	$V^n = \frac{1}{S^n}$	$A_{\overline{n}|} = \frac{1 - 1/S^n}{i}$	$\frac{1}{A_{\overline{n}|}} = \frac{i}{1 - 1/S^n}$

YEARS	1 AMOUNT OF ONE	2 AMOUNT OF ONE PER PERIOD	3 SINKING FUND FACTOR	4 PRESENT WORTH OF ONE	5 PRESENT WORTH ONE PER PERIOD	6 PARTIAL PAYMENT
1	1.032 500	1.000 000	1.000 000	.968 523	.968 523	1.032 500
2	1.066 056	2.032 500	.492 005	.938 037	1.906 560	.524 505
3	1.100 703	3.098 556	.322 731	.908 510	2.815 070	.355 231
4	1.136 476	4.199 259	.238 137	.879 913	3.694 983	.270 637
5	1.173 411	5.335 735	.187 416	.852 216	4.547 199	.219 916
6	1.211 547	6.509 147	.153 630	.825 391	5.372 590	.186 130
7	1.250 923	7.720 694	.129 522	.799 410	6.172 000	.162 022
8	1.291 578	8.971 616	.111 463	.774 247	6.946 247	.143 963
9	1.333 554	10.263 194	.097 436	.749 876	7.696 123	.129 936
10	1.376 894	11.596 748	.086 231	.726 272	8.422 395	.118 731
11	1.421 643	12.973 642	.077 079	.703 411	9.125 806	.109 579
12	1.467 847	14.395 285	.069 467	.681 270	9.807 076	.101 967
13	1.515 552	15.863 132	.063 039	.659 826	10.466 902	.095 539
14	1.564 807	17.378 684	.057 542	.639 056	11.105 958	.090 042
15	1.615 663	18.943 491	.052 789	.618 941	11.724 899	.085 289
16	1.668 173	20.559 155	.048 640	.599 458	12.324 358	.081 140
17	1.722 388	22.227 327	.044 990	.580 589	12.904 947	.077 490
18	1.778 366	23.949 715	.041 754	.562 314	13.467 261	.074 254
19	1.836 163	25.728 081	.038 868	.544 614	14.011 875	.071 368
20	1.895 838	27.564 244	.036 279	.527 471	14.539 346	.068 779
21	1.957 453	29.460 082	.033 944	.510 868	15.050 214	.066 444
22	2.021 070	31.417 534	.031 829	.494 787	15.545 002	.064 329
23	2.086 755	33.438 604	.029 906	.479 213	16.024 215	.062 406
24	2.154 574	35.525 359	.028 149	.464 129	16.488 343	.060 649
25	2.224 598	37.679 933	.026 539	.449 519	16.937 863	.059 039
26	2.296 897	39.904 531	.025 060	.435 370	17.373 233	.057 560
27	2.371 546	42.201 428	.023 696	.421 666	17.794 899	.056 196
28	2.448 622	44.572 975	.022 435	.408 393	18.203 292	.054 935
29	2.528 202	47.021 596	.021 267	.395 538	18.598 830	.053 767
30	2.610 368	49.549 798	.020 182	.383 088	18.981 917	.052 682
31	2.695 205	52.160 167	.019 172	.371 029	19.352 947	.051 672
32	2.782 800	54.855 372	.018 230	.359 350	19.712 297	.050 730
33	2.873 241	57.638 172	.017 350	.348 039	20.060 336	.049 850
34	2.966 621	60.511 412	.016 526	.337 084	20.397 420	.049 026
35	3.063 036	63.478 033	.015 753	.326 473	20.723 893	.048 253
36	3.162 585	66.541 069	.015 028	.316 197	21.040 090	.047 528
37	3.265 369	69.703 654	.014 346	.306 244	21.346 335	.046 846
38	3.371 493	72.969 023	.013 704	.296 604	21.642 939	.046 204
39	3.481 067	76.340 516	.013 099	.287 268	21.930 207	.045 599
40	3.594 201	79.821 583	.012 528	.278 226	22.208 433	.045 028
41	3.711 013	83.415 784	.011 988	.269 468	22.477 901	.044 488
42	3.831 621	87.126 797	.011 478	.260 986	22.738 888	.043 978
43	3.956 149	90.958 418	.010 994	.252 771	22.991 659	.043 494
44	4.084 723	94.914 566	.010 536	.244 815	23.236 473	.043 036
45	4.217 477	98.999 290	.010 101	.237 109	23.473 582	.042 601
46	4.354 545	103.216 767	.009 688	.229 645	23.703 227	.042 188
47	4.496 068	107.571 312	.009 296	.222 417	23.925 644	.041 796
48	4.642 190	112.067 379	.008 923	.215 416	24.141 059	.041 423
49	4.793 061	116.709 569	.008 568	.208 635	24.349 694	.041 068
50	4.948 835	121.502 630	.008 230	.202 068	24.551 762	.040 730
51	5.109 673	126.451 466	.007 908	.195 707	24.747 469	.040 408
52	5.275 737	131.561 138	.007 601	.189 547	24.937 016	.040 101
53	5.447 198	136.836 875	.007 308	.183 581	25.120 597	.039 808
54	5.624 232	142.284 074	.007 028	.177 802	25.298 399	.039 528
55	5.807 020	147.908 306	.006 761	.172 205	25.470 604	.039 261
56	5.995 748	153.715 326	.006 506	.166 785	25.637 389	.039 006
57	6.190 610	159.711 074	.006 261	.161 535	25.798 924	.038 761
58	6.391 805	165.901 684	.006 028	.156 450	25.955 374	.038 528
59	6.599 538	172.293 489	.005 804	.151 526	26.106 900	.038 304
60	6.814 023	178.893 027	.005 590	.146 756	26.253 656	.038 090
	$S^n = (1+i)^n$	$S_{\overline{n}|} = \frac{S^n - 1}{i}$	$1/S_{\overline{n}|} = \frac{i}{S^n - 1}$	$V^n = \frac{1}{S^n}$	$A_{\overline{n}|} = \frac{1 - 1/S^n}{i}$	$\frac{1}{A_{\overline{n}|}} = \frac{i}{1 - 1/S^n}$

YEARS	1 AMOUNT OF ONE	2 AMOUNT OF ONE PER PERIOD	3 SINKING FUND FACTOR	4 PRESENT WORTH OF ONE	5 PRESENT WORTH ONE PER PERIOD	6 PARTIAL PAYMENT
1	1.035 000	1.000 000	1.000 000	.966 184	.966 184	1.035 000
2	1.071 225	2.035 000	.491 400	.933 511	1.899 694	.526 400
3	1.108 718	3.106 225	.321 934	.901 943	2.801 637	.356 934
4	1.147 523	4.214 943	.237 251	.871 442	3.673 079	.272 251
5	1.187 686	5.362 466	.186 481	.841 973	4.515 052	.221 481
6	1.229 255	6.550 152	.152 668	.813 501	5.328 553	.187 668
7	1.272 279	7.779 408	.128 544	.785 991	6.114 544	.163 544
8	1.316 809	9.051 687	.110 477	.759 412	6.873 956	.145 477
9	1.362 897	10.368 496	.096 446	.733 731	7.607 687	.131 446
10	1.410 599	11.731 393	.085 241	.708 919	8.316 605	.120 241
11	1.459 970	13.141 992	.076 092	.684 946	9.001 551	.111 092
12	1.511 069	14.601 962	.068 484	.661 783	9.663 334	.103 484
13	1.563 956	16.113 030	.062 062	.639 404	10.302 738	.097 062
14	1.618 695	17.676 986	.056 571	.617 782	10.920 520	.091 571
15	1.675 349	19.295 681	.051 825	.596 891	11.517 411	.086 825
16	1.733 986	20.971 030	.047 685	.576 706	12.094 117	.082 685
17	1.794 676	22.705 016	.044 043	.557 204	12.651 321	.079 043
18	1.857 489	24.499 691	.040 817	.538 361	13.189 682	.075 817
19	1.922 501	26.357 180	.037 940	.520 156	13.709 837	.072 940
20	1.989 789	28.279 682	.035 361	.502 566	14.212 403	.070 361
21	2.059 431	30.269 471	.033 037	.485 571	14.697 974	.068 037
22	2.131 512	32.328 902	.030 932	.469 151	15.167 125	.065 932
23	2.206 114	34.460 414	.029 019	.453 286	15.620 410	.064 019
24	2.283 328	36.666 528	.027 273	.437 957	16.058 368	.062 273
25	2.363 245	38.949 857	.025 674	.423 147	16.481 515	.060 674
26	2.445 959	41.313 102	.024 205	.408 838	16.890 352	.059 205
27	2.531 567	43.759 060	.022 852	.395 012	17.285 365	.057 852
28	2.620 172	46.290 627	.021 603	.381 654	17.667 019	.056 603
29	2.711 878	48.910 799	.020 445	.368 748	18.035 767	.055 445
30	2.806 794	51.622 677	.019 371	.356 278	18.392 045	.054 371
31	2.905 031	54.429 471	.018 372	.344 230	18.736 276	.053 372
32	3.006 708	57.334 502	.017 442	.332 590	19.068 865	.052 442
33	3.111 942	60.341 210	.016 572	.321 343	19.390 208	.051 572
34	3.220 860	63.453 152	.015 760	.310 476	19.700 684	.050 760
35	3.333 590	66.674 013	.014 998	.299 977	20.000 661	.049 998
36	3.450 266	70.007 603	.014 284	.289 833	20.290 494	.049 284
37	3.571 025	73.457 869	.013 613	.280 032	20.570 525	.048 613
38	3.696 011	77.028 895	.012 982	.270 562	20.841 087	.047 982
39	3.825 372	80.724 906	.012 388	.261 413	21.102 500	.047 388
40	3.959 260	84.550 278	.011 827	.252 572	21.355 072	.046 827
41	4.097 834	88.509 537	.011 298	.244 031	21.599 104	.046 298
42	4.241 258	92.607 371	.010 798	.235 779	21.834 883	.045 798
43	4.389 702	96.848 629	.010 325	.227 806	22.062 689	.045 325
44	4.543 342	101.238 331	.009 878	.220 102	22.282 791	.044 878
45	4.702 359	105.781 673	.009 453	.212 659	22.495 450	.044 453
46	4.866 941	110.484 031	.009 051	.205 468	22.700 918	.044 051
47	5.037 284	115.350 973	.008 669	.198 520	22.899 438	.043 669
48	5.213 589	120.388 257	.008 306	.191 806	23.091 244	.043 306
49	5.396 065	125.601 846	.007 962	.185 320	23.276 564	.042 962
50	5.584 927	130.997 910	.007 634	.179 053	23.455 618	.042 634
51	5.780 399	136.582 837	.007 322	.172 998	23.628 616	.042 322
52	5.982 713	142.363 236	.007 024	.167 148	23.795 765	.042 024
53	6.192 108	148.345 950	.006 741	.161 496	23.957 260	.041 741
54	6.408 832	154.538 058	.006 471	.156 035	24.113 295	.041 471
55	6.633 141	160.946 890	.006 213	.150 758	24.264 053	.041 213
56	6.865 301	167.580 031	.005 967	.145 660	24.409 713	.040 967
57	7.105 587	174.445 332	.005 732	.140 734	24.550 448	.040 732
58	7.354 282	181.550 919	.005 508	.135 975	24.686 423	.040 508
59	7.611 682	188.905 201	.005 294	.131 377	24.817 800	.040 294
60	7.878 091	196.516 883	.005 089	.126 934	24.944 734	.040 089
	$S^n = (1+i)^n$	$S_{\overline{n}|} = \frac{S^n - 1}{i}$	$1/S_{\overline{n}|} = \frac{i}{S^n - 1}$	$V^n = \frac{1}{S^n}$	$A_{\overline{n}|} = \frac{1 - 1/S^n}{i}$	$\frac{1}{A_{\overline{n}|}} = \frac{i}{1 - 1/S^n}$

YEARS	1 AMOUNT OF ONE	2 AMOUNT OF ONE PER PERIOD	3 SINKING FUND FACTOR	4 PRESENT WORTH OF ONE	5 PRESENT WORTH ONE PER PERIOD	6 PARTIAL PAYMENT
1	1.037 500	1.000 000	1.000 000	.963 855	.963 855	1.037 500
2	1.076 406	2.037 500	.490 798	.929 017	1.892 873	.528 298
3	1.116 771	3.113 906	.321 140	.895 438	2.788 311	.358 640
4	1.158 650	4.230 678	.236 369	.863 073	3.651 384	.273 869
5	1.202 100	5.389 328	.185 552	.831 878	4.483 262	.223 052
6	1.247 179	6.591 428	.151 712	.801 810	5.285 072	.189 212
7	1.293 948	7.838 607	.127 574	.772 829	6.057 900	.165 074
8	1.342 471	9.132 554	.109 498	.744 895	6.802 796	.146 998
9	1.392 813	10.475 025	.095 465	.717 971	7.520 767	.132 965
10	1.445 044	11.867 838	.084 261	.692 020	8.212 787	.121 761
11	1.499 233	13.312 882	.075 115	.667 008	8.879 795	.112 615
12	1.555 454	14.812 116	.067 512	.642 899	9.522 694	.105 012
13	1.613 784	16.367 570	.061 096	.619 662	10.142 356	.098 596
14	1.674 301	17.981 354	.055 613	.597 264	10.739 620	.093 113
15	1.737 087	19.655 654	.050 876	.575 676	11.315 296	.088 376
16	1.802 228	21.392 742	.046 745	.554 869	11.870 165	.084 245
17	1.869 811	23.194 969	.043 113	.534 813	12.404 978	.080 613
18	1.939 929	25.064 781	.039 897	.515 483	12.920 461	.077 397
19	2.012 677	27.004 710	.037 031	.496 851	13.417 312	.074 531
20	2.088 152	29.017 387	.034 462	.478 892	13.896 204	.071 962
21	2.166 458	31.105 539	.032 149	.461 583	14.357 787	.069 649
22	2.247 700	33.271 996	.030 055	.444 899	14.802 686	.067 555
23	2.331 989	35.519 696	.028 153	.428 819	15.231 505	.065 653
24	2.419 438	37.851 685	.026 419	.413 319	15.644 824	.063 919
25	2.510 167	40.271 123	.024 832	.398 380	16.043 204	.062 332
26	2.604 298	42.781 290	.023 375	.383 981	16.427 185	.060 875
27	2.701 960	45.385 588	.022 033	.370 102	16.797 286	.059 533
28	2.803 283	48.087 548	.020 795	.356 725	17.154 011	.058 295
29	2.908 406	50.890 831	.019 650	.343 831	17.497 842	.057 150
30	3.017 471	53.799 237	.018 588	.331 403	17.829 245	.056 088
31	3.130 627	56.816 709	.017 600	.319 425	18.148 670	.055 100
32	3.248 025	59.947 335	.016 681	.307 879	18.456 549	.054 181
33	3.369 826	63.195 360	.015 824	.296 751	18.753 301	.053 324
34	3.496 194	66.565 186	.015 023	.286 025	19.039 326	.052 523
35	3.627 302	70.061 381	.014 273	.275 687	19.315 013	.051 773
36	3.763 326	73.688 682	.013 571	.265 722	19.580 735	.051 071
37	3.904 450	77.452 008	.012 911	.256 118	19.836 853	.050 411
38	4.050 867	81.356 458	.012 292	.246 861	20.083 714	.049 792
39	4.202 775	85.407 326	.011 709	.237 938	20.321 652	.049 209
40	4.360 379	89.610 100	.011 159	.229 338	20.550 990	.048 659
41	4.523 893	93.970 479	.010 642	.221 049	20.772 039	.048 142
42	4.693 539	98.494 372	.010 153	.213 059	20.985 097	.047 653
43	4.869 547	103.187 911	.009 691	.205 358	21.190 455	.047 191
44	5.052 155	108.057 458	.009 254	.197 935	21.388 391	.046 754
45	5.241 610	113.109 612	.008 841	.190 781	21.579 172	.046 341
46	5.438 171	118.351 223	.008 449	.183 885	21.763 057	.045 949
47	5.642 102	123.789 394	.008 078	.177 239	21.940 296	.045 578
48	5.853 681	129.431 496	.007 726	.170 833	22.111 129	.045 226
49	6.073 194	135.285 177	.007 392	.164 658	22.275 787	.044 892
50	6.300 939	141.358 371	.007 074	.158 707	22.434 493	.044 574
51	6.537 224	147.659 310	.006 772	.152 970	22.587 463	.044 272
52	6.782 370	154.196 534	.006 485	.147 441	22.734 904	.043 985
53	7.036 709	160.978 904	.006 212	.142 112	22.877 016	.043 712
54	7.300 585	168.015 613	.005 952	.136 975	23.013 992	.043 452
55	7.574 357	175.316 198	.005 704	.132 024	23.146 016	.043 204
56	7.858 396	182.890 556	.005 468	.127 252	23.273 268	.042 968
57	8.153 086	190.748 952	.005 242	.122 653	23.395 921	.042 742
58	8.458 826	198.902 037	.005 028	.118 220	23.514 141	.042 528
59	8.776 032	207.360 864	.004 823	.113 947	23.628 088	.042 323
60	9.105 134	216.136 896	.004 627	.109 828	23.737 916	.042 127
	$S^n = (1+i)^n$	$S_{\overline{n}|} = \frac{S^n - 1}{i}$	$1/S_{\overline{n}|} = \frac{i}{S^n - 1}$	$V^n = \frac{1}{S^n}$	$A_{\overline{n}|} = \frac{1 - 1/S^n}{i}$	$\frac{1}{A_{\overline{n}|}} = \frac{i}{1 - 1/S^n}$

YEARS	1 AMOUNT OF ONE	2 AMOUNT OF ONE PER PERIOD	3 SINKING FUND FACTOR	4 PRESENT WORTH OF ONE	5 PRESENT WORTH ONE PER PERIOD	6 PARTIAL PAYMENT
1	1.040 000	1.000 000	1.000 000	.961 538	.961 538	1.040 000
2	1.081 600	2.040 000	.490 196	.924 556	1.886 095	.530 196
3	1.124 864	3.121 600	.320 349	.888 996	2.775 091	.360 349
4	1.169 859	4.246 464	.235 490	.854 804	3.629 895	.275 490
5	1.216 653	5.416 323	.184 627	.821 927	4.451 822	.224 627
6	1.265 319	6.632 975	.150 762	.790 315	5.242 137	.190 762
7	1.315 932	7.898 294	.126 610	.759 918	6.002 055	.166 610
8	1.368 569	9.214 226	.108 528	.730 690	6.732 745	.148 528
9	1.423 312	10.582 795	.094 493	.702 587	7.435 332	.134 493
10	1.480 244	12.006 107	.083 291	.675 564	8.110 896	.123 291
11	1.539 454	13.486 351	.074 149	.649 581	8.760 477	.114 149
12	1.601 032	15.025 805	.066 552	.624 597	9.385 074	.106 552
13	1.665 074	16.626 838	.060 144	.600 574	9.985 648	.100 144
14	1.731 676	18.291 911	.054 669	.577 475	10.563 123	.094 669
15	1.800 944	20.023 588	.049 941	.555 265	11.118 387	.089 941
16	1.872 981	21.824 531	.045 820	.533 908	11.652 296	.085 820
17	1.947 900	23.697 512	.042 199	.513 373	12.165 669	.082 199
18	2.025 817	25.645 413	.038 993	.493 628	12.659 297	.078 993
19	2.106 849	27.671 229	.036 139	.474 642	13.133 939	.076 139
20	2.191 123	29.778 079	.033 582	.456 387	13.590 326	.073 582
21	2.278 768	31.969 202	.031 280	.438 834	14.029 160	.071 280
22	2.369 919	34.247 970	.029 199	.421 955	14.451 115	.069 199
23	2.464 716	36.617 889	.027 309	.405 726	14.856 842	.067 309
24	2.563 304	39.082 604	.025 587	.390 121	15.246 963	.065 587
25	2.665 836	41.645 908	.024 012	.375 117	15.622 080	.064 012
26	2.772 470	44.311 745	.022 567	.360 689	15.982 769	.062 567
27	2.883 369	47.084 214	.021 239	.346 817	16.329 586	.061 239
28	2.998 703	49.967 583	.020 013	.333 477	16.663 063	.060 013
29	3.118 651	52.966 286	.018 880	.320 651	16.983 715	.058 880
30	3.243 398	56.084 938	.017 830	.308 319	17.292 033	.057 830
31	3.373 133	59.328 335	.016 855	.296 460	17.588 494	.056 855
32	3.508 059	62.701 469	.015 949	.285 058	17.873 551	.055 949
33	3.648 381	66.209 527	.015 104	.274 094	18.147 646	.055 104
34	3.794 316	69.857 909	.014 315	.263 552	18.411 198	.054 315
35	3.946 089	73.652 225	.013 577	.253 415	18.664 613	.053 577
36	4.103 933	77.598 314	.012 887	.243 669	18.908 282	.052 887
37	4.268 090	81.702 246	.012 240	.234 297	19.142 579	.052 240
38	4.438 813	85.970 336	.011 632	.225 285	19.367 864	.051 632
39	4.616 366	90.409 150	.011 061	.216 621	19.584 485	.051 061
40	4.801 021	95.025 516	.010 523	.208 289	19.792 774	.050 523
41	4.993 061	99.826 536	.010 017	.200 278	19.993 052	.050 017
42	5.192 784	104.819 598	.009 540	.192 575	20.185 627	.049 540
43	5.400 495	110.012 382	.009 090	.185 168	20.370 795	.049 090
44	5.616 515	115.412 877	.008 665	.178 046	20.548 841	.048 665
45	5.841 176	121.029 392	.008 262	.171 198	20.720 040	.048 262
46	6.074 823	126.870 568	.007 882	.164 614	20.884 654	.047 882
47	6.317 816	132.945 390	.007 522	.158 283	21.042 936	.047 522
48	6.570 528	139.263 206	.007 181	.152 195	21.195 131	.047 181
49	6.833 349	145.833 734	.006 857	.146 341	21.341 472	.046 857
50	7.106 683	152.667 084	.006 550	.140 713	21.482 185	.046 550
51	7.390 951	159.773 767	.006 259	.135 301	21.617 485	.046 259
52	7.686 589	167.164 718	.005 982	.130 097	21.747 582	.045 982
53	7.994 052	174.851 306	.005 719	.125 093	21.872 675	.045 719
54	8.313 814	182.845 359	.005 469	.120 282	21.992 957	.045 469
55	8.646 367	191.159 173	.005 231	.115 656	22.108 612	.045 231
56	8.992 222	199.805 540	.005 005	.111 207	22.219 819	.045 005
57	9.351 910	208.797 762	.004 789	.106 930	22.326 749	.044 789
58	9.725 987	218.149 672	.004 584	.102 817	22.429 567	.044 584
59	10.115 026	227.875 659	.004 388	.098 863	22.528 430	.044 388
60	10.519 627	237.990 685	.004 202	.095 060	22.623 490	.044 202
	$S^n = (1+i)^n$	$S_{\overline{n}|} = \frac{S^n - 1}{i}$	$1/S_{\overline{n}|} = \frac{i}{S^n - 1}$	$V^n = \frac{1}{S^n}$	$A_{\overline{n}|} = \frac{1 - 1/S^n}{i}$	$\frac{1}{A_{\overline{n}|}} = \frac{i}{1 - 1/S^n}$

YEARS	1 AMOUNT OF ONE	2 AMOUNT OF ONE PER PERIOD	3 SINKING FUND FACTOR	4 PRESENT WORTH OF ONE	5 PRESENT WORTH ONE PER PERIOD	6 PARTIAL PAYMENT
1	1.042 500	1.000 000	1.000 000	.959 233	.959 233	1.042 500
2	1.086 806	2.042 500	.489 596	.920 127	1.879 360	.532 096
3	1.132 996	3.129 306	.319 560	.882 616	2.761 976	.362 060
4	1.181 148	4.262 302	.234 615	.846 634	3.608 610	.277 115
5	1.231 347	5.443 450	.183 707	.812 119	4.420 729	.226 207
6	1.283 679	6.674 796	.149 817	.779 011	5.199 740	.192 317
7	1.338 235	7.958 475	.125 652	.747 253	5.946 993	.168 152
8	1.395 110	9.296 710	.107 565	.716 789	6.663 782	.150 065
9	1.454 402	10.691 820	.093 529	.687 568	7.351 350	.136 029
10	1.516 214	12.146 223	.082 330	.659 537	8.010 887	.124 830
11	1.580 654	13.662 437	.073 193	.632 650	8.643 537	.115 693
12	1.647 831	15.243 091	.065 603	.606 858	9.250 395	.108 103
13	1.717 864	16.890 922	.059 203	.582 118	9.832 513	.101 703
14	1.790 873	18.608 786	.053 738	.558 387	10.390 900	.096 238
15	1.866 986	20.399 660	.049 020	.535 623	10.926 523	.091 520
16	1.946 332	22.266 645	.044 910	.513 787	11.440 309	.087 410
17	2.029 052	24.212 978	.041 300	.492 841	11.933 151	.083 800
18	2.115 286	26.242 029	.038 107	.472 749	12.405 900	.080 607
19	2.205 186	28.357 316	.035 264	.453 477	12.859 376	.077 764
20	2.298 906	30.562 501	.032 720	.434 989	13.294 366	.075 220
21	2.396 610	32.861 408	.030 431	.417 256	13.711 622	.072 931
22	2.498 466	35.258 018	.028 362	.400 246	14.111 868	.070 862
23	2.604 651	37.756 483	.026 486	.383 929	14.495 796	.068 986
24	2.715 348	40.361 134	.024 776	.368 277	14.864 073	.067 276
25	2.830 750	43.076 482	.023 215	.353 263	15.217 336	.065 715
26	2.951 057	45.907 233	.021 783	.338 862	15.556 198	.064 283
27	3.076 477	48.858 290	.020 467	.325 047	15.881 245	.062 967
28	3.207 228	51.934 767	.019 255	.311 796	16.193 041	.061 755
29	3.343 535	55.141 995	.018 135	.299 085	16.492 125	.060 635
30	3.485 635	58.485 530	.017 098	.286 892	16.779 017	.059 598
31	3.633 775	61.971 165	.016 137	.275 196	17.054 213	.058 637
32	3.788 210	65.604 939	.015 243	.263 977	17.318 190	.057 743
33	3.949 209	69.393 149	.014 411	.253 215	17.571 405	.056 911
34	4.117 050	73.342 358	.013 635	.242 892	17.814 298	.056 135
35	4.292 025	77.459 408	.012 910	.232 990	18.047 288	.055 410
36	4.474 436	81.751 433	.012 232	.223 492	18.270 780	.054 732
37	4.664 599	86.225 869	.011 597	.214 381	18.485 160	.054 097
38	4.862 845	90.890 468	.011 002	.205 641	18.690 801	.053 502
39	5.069 516	95.753 313	.010 444	.197 257	18.888 059	.052 944
40	5.284 970	100.822 829	.009 918	.189 216	19.077 275	.052 418
41	5.509 581	106.107 799	.009 424	.181 502	19.258 777	.051 924
42	5.743 739	111.617 381	.008 959	.174 103	19.432 879	.051 459
43	5.987 848	117.361 119	.008 521	.167 005	19.599 884	.051 021
44	6.242 331	123.348 967	.008 107	.160 197	19.760 081	.050 607
45	6.507 630	129.591 298	.007 717	.153 666	19.913 747	.050 217
46	6.784 204	136.098 928	.007 348	.147 401	20.061 148	.049 848
47	7.072 533	142.883 133	.006 999	.141 392	20.202 540	.049 499
48	7.373 116	149.955 666	.006 669	.135 628	20.338 168	.049 169
49	7.686 473	157.328 782	.006 356	.130 099	20.468 266	.048 856
50	8.013 148	165.015 255	.006 060	.124 795	20.593 061	.048 560
51	8.353 707	173.028 403	.005 779	.119 707	20.712 769	.048 279
52	8.708 740	181.382 110	.005 513	.114 827	20.827 596	.048 013
53	9.078 861	190.090 850	.005 261	.110 146	20.937 742	.047 761
54	9.464 713	199.169 711	.005 021	.105 656	21.043 397	.047 521
55	9.866 963	208.634 424	.004 793	.101 348	21.144 746	.047 293
56	10.286 309	218.501 387	.004 577	.097 217	21.241 962	.047 077
57	10.723 477	228.787 696	.004 371	.093. 253	21.335 216	.046 871
58	11.179 225	239.511 173	.004 175	.089 452	21.424 667	.046 675
59	11.654 342	250.690 398	.003 989	.085 805	21.510 472	.046 489
60	12.149 651	262.344 740	.003 812	.082 307	21.592 779	.046 312
	$S^n = (1+i)^n$	$S_{\overline{n}} = \frac{S^n - 1}{i}$	$1/S_{\overline{n}} = \frac{i}{S^n - 1}$	$V^n = \frac{1}{S^n}$	$A_{\overline{n}} = \frac{1 - 1/S^n}{i}$	$\frac{1}{A_{\overline{n}}} = \frac{i}{1 - 1/S^n}$

YEARS	1 AMOUNT OF ONE	2 AMOUNT OF ONE PER PERIOD	3 SINKING FUND FACTOR	4 PRESENT WORTH OF ONE	5 PRESENT WORTH ONE PER PERIOD	6 PARTIAL PAYMENT
1	1.045 000	1.000 000	1.000 000	.956 938	.956 938	1.045 000
2	1.092 025	2.045 000	.488 998	.915 730	1.872 668	.533 998
3	1.141 166	3.137 025	.318 773	.876 297	2.748 964	.363 773
4	1.192 519	4.278 191	.233 744	.838 561	3.587 526	.278 744
5	1.246 182	5.470 710	.182 792	.802 451	4.389 977	.227 792
6	1.302 260	6.716 892	.148 878	.767 896	5.157 872	.193 878
7	1.360 862	8.019 152	.124 701	.734 828	5.892 701	.169 701
8	1.422 101	9.380 014	.106 610	.703 185	6.595 886	.151 610
9	1.486 095	10.802 114	.092 574	.672 904	7.268 790	.137 574
10	1.552 969	12.288 209	.081 379	.643 928	7.912 718	.126 379
11	1.622 853	13.841 179	.072 248	.616 199	8.528 917	.117 248
12	1.695 881	15.464 032	.064 666	.589 664	9.118 581	.109 666
13	1.772 196	17.159 913	.058 275	.564 272	9.682 852	.103 275
14	1.851 945	18.932 109	.052 820	.539 973	10.222 825	.097 820
15	1.935 282	20.784 054	.048 114	.516 720	10.739 546	.093 114
16	2.022 370	22.719 337	.044 015	.494 469	11.234 015	.089 015
17	2.113 377	24.741 707	.040 418	.473 176	11.707 191	.085 418
18	2.208 479	26.855 084	.037 237	.452 800	12.159 992	.082 237
19	2.307 860	29.063 562	.034 407	.433 302	12.593 294	.079 407
20	2.411 714	31.371 423	.031 876	.414 643	13.007 936	.076 876
21	2.520 241	33.783 137	.029 601	.396 787	13.404 724	.074 601
22	2.633 652	36.303 378	.027 546	.379 701	13.784 425	.072 546
23	2.752 166	38.937 030	.025 682	.363 350	14.147 775	.070 682
24	2.876 014	41.689 196	.023 987	.347 703	14.495 478	.068 987
25	3.005 434	44.565 210	.022 439	.332 731	14.828 209	.067 439
26	3.140 679	47.570 645	.021 021	.318 402	15.146 611	.066 021
27	3.282 010	50.711 324	.019 719	.304 691	15.451 303	.064 719
28	3.429 700	53.993 333	.018 521	.291 571	15.742 874	.063 521
29	3.584 036	57.423 033	.017 415	.279 015	16.021 889	.062 415
30	3.745 318	61.007 070	.016 392	.267 000	16.288 889	.061 392
31	3.913 857	64.752 388	.015 443	.255 502	16.544 391	.060 443
32	4.089 981	68.666 245	.014 563	.244 500	16.788 891	.059 563
33	4.274 030	72.756 226	.013 745	.233 971	17.022 862	.058 745
34	4.466 362	77.030 256	.012 982	.223 896	17.246 758	.057 982
35	4.667 348	81.496 618	.012 270	.214 254	17.461 012	.057 270
36	4.877 378	86.163 966	.011 606	.205 028	17.666 041	.056 606
37	5.096 860	91.041 344	.010 984	.196 199	17.862 240	.055 984
38	5.326 219	96.138 205	.010 402	.187 750	18.049 990	.055 402
39	5.565 899	101.464 424	.009 856	.179 665	18.229 656	.054 856
40	5.816 365	107.030 323	.009 343	.171 929	18.401 584	.054 343
41	6.078 101	112.846 688	.008 862	.164 525	18.566 109	.053 862
42	6.351 615	118.924 789	.008 409	.157 440	18.723 550	.053 409
43	6.637 438	125.276 404	.007 982	.150 661	18.874 210	.052 982
44	6.936 123	131.913 842	.007 581	.144 173	19.018 383	.052 581
45	7.248 248	138.849 965	.007 202	.137 964	19.156 347	.052 202
46	7.574 420	146.098 214	.006 845	.132 023	19.288 371	.051 845
47	7.915 268	153.672 633	.006 507	.126 338	19.414 709	.051 507
48	8.271 456	161.587 902	.006 189	.120 898	19.535 607	.051 189
49	8.643 671	169.859 357	.005 887	.115 692	19.651 298	.050 887
50	9.032 636	178.503 028	.005 602	.110 710	19.762 008	.050 602
51	9.439 105	187.535 665	.005 332	.105 942	19.867 950	.050 332
52	9.863 865	196.974 769	.005 077	.101 380	19.969 330	.050 077
53	10.307 739	206.838 634	.004 835	.097 014	20.066 345	.049 835
54	10.771 587	217.146 373	.004 605	.092 837	20.159 181	.049 605
55	11.256 308	227.917 959	.004 388	.088 839	20.248 021	.049 388
56	11.762 842	239.174 268	.004 181	.085 013	20.333 034	.049 181
57	12.292 170	250.937 110	.003 985	.081 353	20.414 387	.048 985
58	12.845 318	263.229 280	.003 799	.077 849	20.492 236	.048 799
59	13.423 357	276.074 597	.003 622	.074 497	20.566 733	.048 622
60	14.027 408	289.497 954	.003 454	.071 289	20.638 022	.048 454
	$S^n = (1+i)^n$	$S_{\overline{n}|} = \frac{S^n - 1}{i}$	$1/S_{\overline{n}|} = \frac{i}{S^n - 1}$	$V^n = \frac{1}{S^n}$	$A_{\overline{n}|} = \frac{1 - 1/S^n}{i}$	$\frac{1}{A_{\overline{n}|}} = \frac{i}{1 - 1/S^n}$

YEARS	1 AMOUNT OF ONE	2 AMOUNT OF ONE PER PERIOD	3 SINKING FUND FACTOR	4 PRESENT WORTH OF ONE	5 PRESENT WORTH ONE PER PERIOD	6 PARTIAL PAYMENT
1	1.047 500	1.000 000	1.000 000	.954 654	.954 654	1.047 500
2	1.097 256	2.047 500	.488 400	.911 364	1.866 018	.535 900
3	1.149 376	3.144 756	.317 990	.870 037	2.736 055	.365 490
4	1.203 971	4.294 132	.232 876	.830 585	3.566 640	.280 376
5	1.261 160	5.498 103	.181 881	.792 921	4.359 561	.229 381
6	1.321 065	6.759 263	.147 945	.756 965	5.116 526	.195 445
7	1.383 816	8.080 328	.123 757	.722 640	5.839 166	.171 257
8	1.449 547	9.464 144	.105 662	.689 871	6.529 036	.153 162
9	1.518 400	10.913 691	.091 628	.658 588	7.187 624	.139 128
10	1.590 524	12.432 091	.080 437	.628 723	7.816 348	.127 937
11	1.666 074	14.022 615	.071 313	.600 213	8.416 561	.118 813
12	1.745 213	15.688 690	.063 740	.572 996	8.989 557	.111 240
13	1.828 110	17.433 902	.057 360	.547 013	9.536 570	.104 860
14	1.914 946	19.262 013	.051 916	.522 208	10.058 778	.099 416
15	2.005 906	21.176 958	.047 221	.498 528	10.557 306	.094 721
16	2.101 186	23.182 864	.043 135	.475 922	11.033 228	.090 635
17	2.200 992	25.284 050	.039 551	.454 341	11.487 568	.087 051
18	2.305 540	27.485 042	.036 383	.433 738	11.921 306	.083 883
19	2.415 053	29.790 582	.033 568	.414 070	12.335 376	.081 068
20	2.529 768	32.205 635	.031 050	.395 293	12.730 669	.078 550
21	2.649 932	34.735 402	.028 789	.377 368	13.108 037	.076 289
22	2.775 803	37.385 334	.026 748	.360 256	13.468 293	.074 248
23	2.907 654	40.161 137	.024 900	.343 920	13.812 213	.072 400
24	3.045 768	43.068 791	.023 219	.328 324	14.140 538	.070 719
25	3.190 442	46.114 559	.021 685	.313 436	14.453 974	.069 185
26	3.341 988	49.305 000	.020 282	.299 223	14.753 197	.067 782
27	3.500 732	52.646 988	.018 994	.285 655	15.038 852	.066 494
28	3.667 017	56.147 720	.017 810	.272 701	15.311 553	.065 310
29	3.841 200	59.814 736	.016 718	.260 335	15.571 888	.064 218
30	4.023 657	63.655 936	.015 709	.248 530	15.820 418	.063 209
31	4.214 781	67.679 593	.014 776	.237 260	16.057 679	.062 276
32	4.414 983	71.894 374	.013 909	.226 501	16.284 180	.061 409
33	4.624 694	76.309 357	.013 105	.216 231	16.500 410	.060 605
34	4.844 367	80.934 051	.012 356	.206 425	16.706 836	.059 856
35	5.074 475	85.778 419	.011 658	.197 065	16.903 901	.059 158
36	5.315 512	90.852 894	.011 007	.188 129	17.092 029	.058 507
37	5.567 999	96.168 406	.010 398	.179 598	17.271 627	.057 898
38	5.832 479	101.736 405	.009 829	.171 454	17.443 081	.057 329
39	6.109 522	107.568 884	.009 296	.163 679	17.606 759	.056 796
40	6.399 724	113.678 406	.008 797	.156 257	17.763 016	.056 297
41	6.703 711	120.078 131	.008 328	.149 171	17.912 187	.055 828
42	7.022 137	126.781 842	.007 888	.142 407	18.054 594	.055 388
43	7.355 689	133.803 980	.007 474	.135 949	18.190 543	.054 974
44	7.705 084	141.159 669	.007 084	.129 784	18.320 328	.054 584
45	8.071 076	148.864 753	.006 718	.123 899	18.444 227	.054 218
46	8.454 452	156.935 829	.006 372	.118 281	18.562 508	.053 872
47	8.856 038	165.390 280	.006 046	.112 917	18.675 425	.053 546
48	9.276 700	174.246 319	.005 739	.107 797	18.783 222	.053 239
49	9.717 343	183.523 019	.005 449	.102 909	18.886 131	.052 949
50	10.178 917	193.240 362	.005 175	.098 242	18.984 373	.052 675
51	10.662 416	203.419 279	.004 916	.093 787	19.078 160	.052 416
52	11.168 881	214.081 695	.004 671	.089 534	19.167 695	.052 171
53	11.699 402	225.250 576	.004 440	.085 474	19.253 169	.051 940
54	12.255 124	236.949 978	.004 220	.081 599	19.334 768	.051 720
55	12.837 242	249.205 102	.004 013	.077 898	19.412 666	.051 513
56	13.447 011	262.042 344	.003 816	.074 366	19.487 032	.051 316
57	14.085 744	275.489 356	.003 630	.070 994	19.558 026	.051 130
58	14.754 817	289.575 100	.003 453	.067 774	19.625 801	.050 953
59	15.455 671	304.329 917	.003 286	.064 701	19.690 502	.050 786
60	16.189 815	319.785 589	.003 127	.061 767	19.752 269	.050 627
	$S^n = (1+i)^n$	$S_{\overline{n}|} = \frac{S^n - 1}{i}$	$1/S_{\overline{n}|} = \frac{i}{S^n - 1}$	$V^n = \frac{1}{S^n}$	$A_{\overline{n}|} = \frac{1 - 1/S^n}{i}$	$\frac{1}{A_{\overline{n}|}} = \frac{i}{1 - 1/S^n}$

YEARS	1 AMOUNT OF ONE	2 AMOUNT OF ONE PER PERIOD	3 SINKING FUND FACTOR	4 PRESENT WORTH OF ONE	5 PRESENT WORTH ONE PER PERIOD	6 PARTIAL PAYMENT
1	1.050 000	1.000 000	1.000 000	.952 381	.952 381	1.050 000
2	1.102 500	2.050 000	.487 805	.907 029	1.859 410	.537 805
3	1.157 625	3.152 500	.317 209	.863 838	2.723 248	.367 209
4	1.215 506	4.310 125	.232 012	.822 702	3.545 951	.282 012
5	1.276 282	5.525 631	.180 975	.783 526	4.329 477	.230 975
6	1.340 096	6.801 913	.147 017	.746 215	5.075 692	.197 017
7	1.407 100	8.142 008	.122 820	.710 681	5.786 373	.172 820
8	1.477 455	9.549 109	.104 722	.676 839	6.463 213	.154 722
9	1.551 328	11.026 564	.090 690	.644 609	7.107 822	.140 690
10	1.628 895	12.577 893	.079 505	.613 913	7.721 735	.129 505
11	1.710 339	14.206 787	.070 389	.584 679	8.306 414	.120 389
12	1.795 856	15.917 127	.062 825	.556 837	8.863 252	.112 825
13	1.885 649	17.712 983	.056 456	.530 321	9.393 573	.106 456
14	1.979 932	19.598 632	.051 024	.505 068	9.898 641	.101 024
15	2.078 928	21.578 564	.046 342	.481 017	10.379 658	.096 342
16	2.182 875	23.657 492	.042 270	.458 112	10.837 770	.092 270
17	2.292 018	25.840 366	.038 699	.436 297	11.274 066	.088 699
18	2.406 619	28.132 385	.035 546	.415 521	11.689 587	.085 546
19	2.526 950	30.539 004	.032 745	.395 734	12.085 321	.082 745
20	2.653 298	33.065 954	.030 243	.376 889	12.462 210	.080 243
21	2.785 963	35.719 252	.027 996	.358 942	12.821 153	.077 996
22	2.925 261	38.505 214	.025 971	.341 850	13.163 003	.075 971
23	3.071 524	41.430 475	.024 137	.325 571	13.488 574	.074 137
24	3.225 100	44.501 999	.022 471	.310 068	13.798 642	.072 471
25	3.386 355	47.727 099	.020 952	.295 303	14.093 945	.070 952
26	3.555 673	51.113 454	.019 564	.281 241	14.375 185	.069 564
27	3.733 456	54.669 126	.018 292	.267 848	14.643 034	.068 292
28	3.920 129	58.402 583	.017 123	.255 094	14.898 127	.067 123
29	4.116 136	62.322 712	.016 046	.242 946	15.141 074	.066 046
30	4.321 942	66.438 848	.015 051	.231 377	15.372 451	.065 051
31	4.538 039	70.760 790	.014 132	.220 359	15.592 811	.064 132
32	4.764 941	75.298 829	.013 280	.209 866	15.802 677	.063 280
33	5.003 189	80.063 771	.012 490	.199 873	16.002 549	.062 490
34	5.253 348	85.066 959	.011 755	.190 355	16.192 904	.061 755
35	5.516 015	90.320 307	.011 072	.181 290	16.374 194	.061 072
36	5.791 816	95.836 323	.010 434	.172 657	16.546 852	.060 434
37	6.081 407	101.628 139	.009 840	.164 436	16.711 287	.059 840
38	6.385 477	107.709 546	.009 284	.156 605	16.867 893	.059 284
39	6.704 751	114.095 023	.008 765	.149 148	17.017 041	.058 765
40	7.039 989	120.799 774	.008 278	.142 046	17.159 086	.058 278
41	7.391 988	127.839 763	.007 822	.135 282	17.294 368	.057 822
42	7.761 588	135.231 751	.007 395	.128 840	17.423 208	.057 395
43	8.149 667	142.993 339	.006 993	.122 704	17.545 912	.056 993
44	8.557 150	151.143 006	.006 616	.116 861	17.662 773	.056 616
45	8.985 008	159.700 156	.006 262	.111 297	17.774 070	.056 262
46	9.434 258	168.685 164	.005 928	.105 997	17.880 066	.055 928
47	9.905 971	178.119 422	.005 614	.100 949	17.981 016	.055 614
48	10.401 270	188.025 393	.005 318	.096 142	18.077 158	.055 318
49	10.921 333	198.426 663	.005 040	.091 564	18.168 722	.055 040
50	11.467 400	209.347 996	.004 777	.087 204	18.255 925	.054 777
51	12.040 770	220.815 396	.004 529	.083 051	18.338 977	.054 529
52	12.642 808	232.856 165	.004 294	.079 096	18.418 073	.054 294
53	13.274 949	245.498 974	.004 073	.075 330	18.493 403	.054 073
54	13.938 696	258.773 922	.003 864	.071 743	18.565 146	.053 864
55	14.635 631	272.712 618	.003 667	.068 326	18.633 472	.053 667
56	15.367 412	287.348 249	.003 480	.065 073	18.698 545	.053 480
57	16.135 783	302.715 662	.003 303	.061 974	18.760 519	.053 303
58	16.942 572	318.851 445	.003 136	.059 023	18.819 542	.053 136
59	17.789 701	335.794 017	.002 978	.056 212	18.875 754	.052 978
60	18.679 186	353.583 718	.002 828	.053 536	18.929 290	.052 828
	$S^n = (1+i)^n$	$S_{\overline{n}|} = \frac{S^n - 1}{i}$	$1/S_{\overline{n}|} = \frac{i}{S^n - 1}$	$V^n = \frac{1}{S^n}$	$A_{\overline{n}|} = \frac{1 - 1/S^n}{i}$	$\frac{1}{A_{\overline{n}|}} = \frac{i}{1 - 1/S^n}$

YEARS	1 AMOUNT OF ONE	2 AMOUNT OF ONE PER PERIOD	3 SINKING FUND FACTOR	4 PRESENT WORTH OF ONE	5 PRESENT WORTH ONE PER PERIOD	6 PARTIAL PAYMENT
1	1.052 500	1.000 000	1.000 000	.950 119	.950 119	1.052 500
2	1.107 756	2.052 500	.487 211	.902 726	1.852 844	.539 711
3	1.165 913	3.160 256	.316 430	.857 697	2.710 541	.368 930
4	1.227 124	4.326 170	.231 151	.814 914	3.525 455	.283 651
5	1.291 548	5.553 294	.180 073	.774 265	4.299 719	.232 573
6	1.359 354	6.844 842	.146 095	.735 643	5.035 363	.198 595
7	1.430 720	8.204 196	.121 889	.698 949	5.734 311	.174 389
8	1.505 833	9.634 916	.103 789	.664 084	6.398 396	.156 289
9	1.584 889	11.140 749	.089 761	.630 959	7.029 355	.142 261
10	1.668 096	12.725 638	.078 582	.599 486	7.628 840	.131 082
11	1.755 671	14.393 734	.069 475	.569 583	8.198 423	.121 975
12	1.847 844	16.149 405	.061 922	.541 171	8.739 595	.114 422
13	1.944 856	17.997 249	.055 564	.514 177	9.253 772	.108 064
14	2.046 961	19.942 105	.050 145	.488 529	9.742 301	.102 645
15	2.154 426	21.989 065	.045 477	.464 161	10.206 462	.097 977
16	2.267 533	24.143 491	.041 419	.441 008	10.647 469	.093 919
17	2.386 579	26.411 025	.037 863	.419 010	11.066 479	.090 363
18	2.511 874	28.797 603	.034 725	.398 109	11.464 588	.087 225
19	2.643 748	31.309 478	.031 939	.378 251	11.842 839	.084 439
20	2.782 544	33.953 225	.029 452	.359 383	12.202 223	.081 952
21	2.928 628	36.735 769	.027 221	.341 457	12.543 679	.079 721
22	3.082 381	39.664 397	.025 212	.324 425	12.868 104	.077 712
23	3.244 206	42.746 778	.023 394	.308 242	13.176 346	.075 894
24	3.414 527	45.990 984	.021 743	.292 866	13.469 212	.074 243
25	3.593 789	49.405 511	.020 241	.278 258	13.747 470	.072 741
26	3.782 463	52.999 300	.018 868	.264 378	14.011 848	.071 368
27	3.981 043	56.781 763	.017 611	.251 190	14.263 038	.070 111
28	4.190 047	60.762 806	.016 457	.238 661	14.501 699	.068 957
29	4.410 025	64.952 853	.015 396	.226 756	14.728 455	.067 896
30	4.641 551	69.362 878	.014 417	.215 445	14.943 901	.066 917
31	4.885 233	74.004 429	.013 513	.204 699	15.148 599	.066 013
32	5.141 707	78.889 662	.012 676	.194 488	15.343 087	.065 176
33	5.411 647	84.031 369	.011 900	.184 787	15.527 874	.064 400
34	5.695 758	89.443 016	.011 180	.175 569	15.703 443	.063 680
35	5.994 786	95.138 774	.010 511	.166 812	15.870 255	.063 011
36	6.309 512	101.133 560	.009 888	.158 491	16.028 745	.062 388
37	6.640 761	107.443 071	.009 307	.150 585	16.179 331	.061 807
38	6.989 401	114.083 833	.008 765	.143 074	16.322 404	.061 265
39	7.356 345	121.073 234	.008 259	.135 937	16.458 341	.060 759
40	7.742 553	128.429 579	.007 786	.129 156	16.587 498	.060 286
41	8.149 037	136.172 132	.007 344	.122 714	16.710 212	.059 844
42	8.576 861	144.321 169	.006 929	.116 593	16.826 804	.059 429
43	9.027 147	152.898 030	.006 540	.110 777	16.937 581	.059 040
44	9.501 072	161.925 176	.006 176	.105 251	17.042 833	.058 676
45	9.999 878	171.426 248	.005 833	.100 001	17.142 834	.058 333
46	10.524 872	181.426 126	.005 512	.095 013	17.237 847	.058 012
47	11.077 427	191.950 998	.005 210	.090 274	17.328 121	.057 710
48	11.658 992	203.028 425	.004 925	.085 771	17.413 891	.057 425
49	12.271 089	214.687 418	.004 658	.081 492	17.495 384	.057 158
50	12.915 322	226.958 507	.004 406	.077 427	17.572 811	.056 906
51	13.593 376	239.873 829	.004 169	.073 565	17.646 376	.056 669
52	14.307 028	253.467 205	.003 945	.069 896	17.716 272	.056 445
53	15.058 147	267.774 233	.003 734	.066 409	17.782 681	.056 234
54	15.848 700	282.832 380	.003 536	.063 097	17.845 778	.056 036
55	16.680 757	298.681 080	.003 348	.059 949	17.905 727	.055 848
56	17.556 496	315.361 837	.003 171	.056 959	17.962 686	.055 671
57	18.478 212	332.918 333	.003 004	.054 118	18.016 804	.055 504
58	19.448 319	351.396 546	.002 846	.051 418	18.068 222	.055 346
59	20.469 355	370.844 864	.002 697	.048 854	18.117 076	.055 197
60	21.543 997	391.314 220	.002 555	.046 417	18.163 493	.055 055
	$S^n = (1+i)^n$	$S_{\overline{n}|} = \frac{S^n - 1}{i}$	$1/S_{\overline{n}|} = \frac{i}{S^n - 1}$	$V^n = \frac{1}{S^n}$	$A_{\overline{n}|} = \frac{1 - 1/S^n}{i}$	$\frac{1}{A_{\overline{n}|}} = \frac{i}{1 - 1/S^n}$

YEARS	1 AMOUNT OF ONE	2 AMOUNT OF ONE PER PERIOD	3 SINKING FUND FACTOR	4 PRESENT WORTH OF ONE	5 PRESENT WORTH ONE PER PERIOD	6 PARTIAL PAYMENT
1	1.055 000	1.000 000	1.000 000	.947 867	.947 867	1.055 000
2	1.113 025	2.055 000	.486 618	.898 452	1.846 320	.541 618
3	1.174 241	3.168 025	.315 654	.851 614	2.697 933	.370 654
4	1.238 825	4.342 266	.230 294	.807 217	3.505 150	.285 294
5	1.306 960	5.581 091	.179 176	.765 134	4.270 284	.234 176
6	1.378 843	6.888 051	.145 179	.725 246	4.995 530	.200 179
7	1.454 679	8.266 894	.120 964	.687 437	5.682 967	.175 964
8	1.534 687	9.721 573	.102 864	.651 599	6.334 566	.157 864
9	1.619 094	11.256 260	.088 839	.617 629	6.952 195	.143 839
10	1.708 144	12.875 354	.077 668	.585 431	7.537 626	.132 668
11	1.802 092	14.583 498	.068 571	.554 911	8.092 536	.123 571
12	1.901 207	16.385 591	.061 029	.525 982	8.618 518	.116 029
13	2.005 774	18.286 798	.054 684	.498 561	9.117 079	.109 684
14	2.116 091	20.292 572	.049 279	.472 569	9.589 648	.104 279
15	2.232 476	22.408 663	.044 626	.447 933	10.037 581	.099 626
16	2.355 263	24.641 140	.040 583	.424 581	10.462 162	.095 583
17	2.484 802	26.996 403	.037 042	.402 447	10.864 609	.092 042
18	2.621 466	29.481 205	.033 920	.381 466	11.246 074	.088 920
19	2.765 647	32.102 671	.031 150	.361 579	11.607 654	.086 150
20	2.917 757	34.868 318	.028 679	.342 729	11.950 382	.083 679
21	3.078 234	37.786 076	.026 465	.324 862	12.275 244	.081 465
22	3.247 537	40.864 310	.024 471	.307 926	12.583 170	.079 471
23	3.426 152	44.111 847	.022 670	.291 873	12.875 042	.077 670
24	3.614 590	47.537 998	.021 036	.276 657	13.151 699	.076 036
25	3.813 392	51.152 588	.019 549	.262 234	13.413 933	.074 549
26	4.023 129	54.965 981	.018 193	.248 563	13.662 495	.073 193
27	4.244 401	58.989 109	.016 952	.235 605	13.898 100	.071 952
28	4.477 843	63.233 510	.015 814	.223 322	14.121 422	.070 814
29	4.724 124	67.711 354	.014 769	.211 679	14.333 101	.069 769
30	4.983 951	72.435 478	.013 805	.200 644	14.533 745	.068 805
31	5.258 069	77.419 429	.012 917	.190 184	14.723 929	.067 917
32	5.547 262	82.677 498	.012 095	.180 269	14.904 198	.067 095
33	5.852 362	88.224 760	.011 335	.170 871	15.075 069	.066 335
34	6.174 242	94.077 122	.010 630	.161 963	15.237 033	.065 630
35	6.513 825	100.251 364	.009 975	.153 520	15.390 552	.064 975
36	6.872 085	106.765 189	.009 366	.145 516	15.536 068	.064 366
37	7.250 050	113.637 274	.008 800	.137 930	15.673 999	.063 800
38	7.648 803	120.887 324	.008 272	.130 739	15.804 738	.063 272
39	8.069 487	128.536 127	.007 780	.123 924	15.928 662	.062 780
40	8.513 309	136.605 614	.007 320	.117 463	16.046 125	.062 320
41	8.981 541	145.118 923	.006 891	.111 339	16.157 464	.061 891
42	9.475 525	154.100 464	.006 489	.105 535	16.262 999	.061 489
43	9.996 679	163.575 989	.006 113	.100 033	16.363 032	.061 113
44	10.546 497	173.572 669	.005 761	.094 818	16.457 851	.060 761
45	11.126 554	184.119 165	.005 431	.089 875	16.547 726	.060 431
46	11.738 515	195.245 719	.005 122	.085 190	16.632 915	.060 122
47	12.384 133	206.984 234	.004 831	.080 748	16.713 664	.059 831
48	13.065 260	219.368 367	.004 559	.076 539	16.790 203	.059 559
49	13.783 849	232.433 627	.004 302	.072 549	16.862 751	.059 302
50	14.541 961	246.217 476	.004 061	.068 767	16.931 518	.059 061
51	15.341 769	260.759 438	.003 835	.065 182	16.996 699	.058 835
52	16.185 566	276.101 207	.003 622	.061 783	17.058 483	.058 622
53	17.075 773	292.286 773	.003 421	.058 563	17.117 045	.058 421
54	18.014 940	309.362 546	.003 232	.055 509	17.172 555	.058 232
55	19.005 762	327.377 486	.003 055	.052 616	17.225 170	.058 055
56	20.051 079	346.383 247	.002 887	.049 873	17.275 043	.057 887
57	21.153 888	366.434 326	.002 729	.047 273	17.322 316	.057 729
58	22.317 352	387.588 214	.002 580	.044 808	17.367 124	.057 580
59	23.544 806	409.905 566	.002 440	.042 472	17.409 596	.057 440
60	24.839 770	433.450 372	.002 307	.040 258	17.449 854	.057 307
	$S^n = (1+i)^n$	$S_{\overline{n}|} = \frac{S^n - 1}{i}$	$1/S_{\overline{n}|} = \frac{i}{S^n - 1}$	$V^n = \frac{1}{S^n}$	$A_{\overline{n}|} = \frac{1 - 1/S^n}{i}$	$\frac{1}{A_{\overline{n}|}} = \frac{i}{1 - 1/S^n}$

YEARS	1 AMOUNT OF ONE	2 AMOUNT OF ONE PER PERIOD	3 SINKING FUND FACTOR	4 PRESENT WORTH OF ONE	5 PRESENT WORTH ONE PER PERIOD	6 PARTIAL PAYMENT
1	1.057 500	1.000 000	1.000 000	.945 626	.945 626	1.057 500
2	1.118 306	2.057 500	.486 027	.894 209	1.839 836	.543 527
3	1.182 609	3.175 806	.314 881	.845 588	2.685 424	.372 381
4	1.250 609	4.358 415	.229 441	.799 611	3.485 035	.286 941
5	1.322 519	5.609 024	.178 284	.756 133	4.241 167	.235 784
6	1.398 564	6.931 543	.144 268	.715 019	4.956 187	.201 768
7	1.478 981	8.330 107	.120 046	.676 141	5.632 328	.177 546
8	1.564 023	9.809 088	.101 946	.639 377	6.271 705	.159 446
9	1.653 954	11.373 110	.087 927	.604 612	6.876 317	.145 427
10	1.749 056	13.027 064	.076 763	.571 737	7.448 054	.134 263
11	1.849 627	14.776 120	.067 677	.540 650	7.988 703	.125 177
12	1.955 980	16.625 747	.060 148	.511 253	8.499 956	.117 648
13	2.068 449	18.581 728	.053 816	.483 454	8.983 410	.111 316
14	2.187 385	20.650 177	.048 426	.457 167	9.440 576	.105 926
15	2.313 160	22.837 562	.043 788	.432 309	9.872 886	.101 288
16	2.446 167	25.150 722	.039 760	.408 803	10.281 688	.097 260
17	2.586 821	27.596 888	.036 236	.386 575	10.668 263	.093 736
18	2.735 563	30.183 710	.033 130	.365 555	11.033 819	.090 630
19	2.892 858	32.919 273	.030 377	.345 679	11.379 498	.087 877
20	3.059 198	35.812 131	.027 923	.326 883	11.706 381	.085 423
21	3.235 101	38.871 329	.025 726	.309 109	12.015 490	.083 226
22	3.421 120	42.106 430	.023 749	.292 302	12.307 792	.081 249
23	3.617 834	45.527 550	.021 965	.276 408	12.584 200	.079 465
24	3.825 860	49.145 384	.020 348	.261 379	12.845 580	.077 848
25	4.045 846	52.971 243	.018 878	.247 167	13.092 747	.076 378
26	4.278 483	57.017 090	.017 539	.233 728	13.326 474	.075 039
27	4.524 495	61.295 573	.016 314	.221 019	13.547 494	.073 814
28	4.784 654	65.820 068	.015 193	.209 002	13.756 495	.072 693
29	5.059 772	70.604 722	.014 163	.197 637	13.954 132	.071 663
30	5.350 708	75.664 493	.013 216	.186 891	14.141 024	.070 716
31	5.658 374	81.015 202	.012 343	.176 729	14.317 753	.069 843
32	5.983 731	86.673 576	.011 538	.167 120	14.484 873	.069 038
33	6.327 795	92.657 307	.010 792	.158 033	14.642 906	.068 292
34	6.691 643	98.985 102	.010 103	.149 440	14.792 346	.067 603
35	7.076 413	105.676 745	.009 463	.141 315	14.933 660	.066 963
36	7.483 307	112.753 158	.008 869	.133 631	15.067 291	.066 369
37	7.913 597	120.236 464	.008 317	.126 365	15.193 656	.065 817
38	8.368 629	128.150 061	.007 803	.119 494	15.313 150	.065 303
39	8.849 825	136.518 690	.007 325	.112 997	15.426 146	.064 825
40	9.358 690	145.368 514	.006 879	.106 853	15.532 999	.064 379
41	9.896 814	154.727 204	.006 463	.101 043	15.634 041	.063 963
42	10.465 881	164.624 018	.006 074	.095 549	15.729 590	.063 574
43	11.067 669	175.089 899	.005 711	.090 353	15.819 943	.063 211
44	11.704 060	186.157 568	.005 372	.085 440	15.905 384	.062 872
45	12.377 044	197.861 628	.005 054	.080 795	15.986 178	.062 554
46	13.088 724	210.238 672	.004 756	.076 402	16.062 580	.062 256
47	13.841 325	223.327 396	.004 478	.072 247	16.134 828	.061 978
48	14.637 201	237.168 721	.004 216	.068 319	16.203 147	.061 716
49	15.478 841	251.805 922	.003 971	.064 604	16.267 751	.061 471
50	16.368 874	267.284 763	.003 741	.061 092	16.328 842	.061 241
51	17.310 084	283.653 637	.003 525	.057 770	16.386 612	.061 025
52	18.305 414	300.963 721	.003 323	.054 629	16.441 241	.060 823
53	19.357 975	319.269 135	.003 132	.051 658	16.492 899	.060 632
54	20.471 059	338.627 110	.002 953	.048 849	16.541 749	.060 453
55	21.648 145	359.098 169	.002 785	.046 193	16.587 942	.060 285
56	22.892 913	380.746 314	.002 626	.043 682	16.631 624	.060 126
57	24.209 256	403.639 227	.002 477	.041 307	16.672 930	.059 977
58	25.601 288	427.848 482	.002 337	.039 061	16.711 991	.059 837
59	27.073 362	453.449 770	.002 205	.036 937	16.748 927	.059 705
60	28.630 080	480.523 132	.002 081	.034 928	16.783 856	.059 581
	$S^n = (1+i)^n$	$S_{\overline{n}|} = \frac{S^n - 1}{i}$	$1/S_{\overline{n}|} = \frac{i}{S^n - 1}$	$V^n = \frac{1}{S^n}$	$A_{\overline{n}|} = \frac{1 - 1/S^n}{i}$	$\frac{1}{A_{\overline{n}|}} = \frac{i}{1 - 1/S^n}$

YEARS	1 AMOUNT OF ONE	2 AMOUNT OF ONE PER PERIOD	3 SINKING FUND FACTOR	4 PRESENT WORTH OF ONE	5 PRESENT WORTH ONE PER PERIOD	6 PARTIAL PAYMENT
1	1.060 000	1.000 000	1.000 000	.943 396	.943 396	1.060 000
2	1.123 600	2.060 000	.485 437	.889 996	1.833 393	.545 437
3	1.191 016	3.183 600	.314 110	.839 619	2.673 012	.374 110
4	1.262 477	4.374 616	.228 591	.792 094	3.465 106	.288 591
5	1.338 226	5.637 093	.177 396	.747 258	4.212 364	.237 396
6	1.418 519	6.975 319	.143 363	.704 961	4.917 324	.203 363
7	1.503 630	8.393 838	.119 135	.665 057	5.582 381	.179 135
8	1.593 848	9.897 468	.101 036	.627 412	6.209 794	.161 036
9	1.689 479	11.491 316	.087 022	.591 898	6.801 692	.147 022
10	1.790 848	13.180 795	.075 868	.558 395	7.360 087	.135 868
11	1.898 299	14.971 643	.066 793	.526 788	7.886 875	.126 793
12	2.012 196	16.869 941	.059 277	.496 969	8.383 844	.119 277
13	2.132 928	18.882 138	.052 960	.468 839	8.852 683	.112 960
14	2.260 904	21.015 066	.047 585	.442 301	9.294 984	.107 585
15	2.396 558	23.275 970	.042 963	.417 265	9.712 249	.102 963
16	2.540 352	25.672 528	.038 952	.393 646	10.105 895	.098 952
17	2.692 773	28.212 880	.035 445	.371 364	10.477 260	.095 445
18	2.854 339	30.905 653	.032 357	.350 344	10.827 603	.092 357
19	3.025 600	33.759 992	.029 621	.330 513	11.158 116	.089 621
20	3.207 135	36.785 591	.027 185	.311 805	11.469 921	.087 185
21	3.399 564	39.992 727	.025 005	.294 155	11.764 077	.085 005
22	3.603 537	43.392 290	.023 046	.277 505	12.041 582	.083 046
23	3.819 750	46.995 828	.021 278	.261 797	12.303 379	.081 278
24	4.048 935	50.815 577	.019 679	.246 979	12.550 358	.079 679
25	4.291 871	54.864 512	.018 227	.232 999	12.783 356	.078 227
26	4.549 383	59.156 383	.016 904	.219 810	13.003 166	.076 904
27	4.822 346	63.705 766	.015 697	.207 368	13.210 534	.075 697
28	5.111 687	68.528 112	.014 593	.195 630	13.406 164	.074 593
29	5.418 388	73.639 798	.013 580	.184 557	13.590 721	.073 580
30	5.743 491	79.058 186	.012 649	.174 110	13.764 831	.072 649
31	6.088 101	84.801 677	.011 792	.164 255	13.929 086	.071 792
32	6.453 387	90.889 778	.011 002	.154 957	14.084 043	.071 002
33	6.840 590	97.343 165	.010 273	.146 186	14.230 230	.070 273
34	7.251 025	104.183 755	.009 598	.137 912	14.368 141	.069 598
35	7.686 087	111.434 780	.008 974	.130 105	14.498 246	.068 974
36	8.147 252	119.120 867	.008 395	.122 741	14.620 987	.068 395
37	8.636 087	127.268 119	.007 857	.115 793	14.736 780	.067 857
38	9.154 252	135.904 206	.007 358	.109 239	14.846 019	.067 358
39	9.703 507	145.058 458	.006 894	.103 056	14.949 075	.066 894
40	10.285 718	154.761 966	.006 462	.097 222	15.046 297	.066 462
41	10.902 861	165.047 684	.006 059	.091 719	15.138 016	.066 059
42	11.557 033	175.950 545	.005 683	.086 527	15.224 543	.065 683
43	12.250 455	187.507 577	.005 333	.081 630	15.306 173	.065 333
44	12.985 482	199.758 032	.005 006	.077 009	15.383 182	.065 006
45	13.764 611	212.743 514	.004 700	.072 650	15.455 832	.064 700
46	14.590 487	226.508 125	.004 415	.068 538	15.524 370	.064 415
47	15.465 917	241.098 612	.004 148	.064 658	15.589 028	.064 148
48	16.393 872	256.564 529	.003 898	.060 998	15.650 027	.063 898
49	17.377 504	272.958 401	.003 664	.057 546	15.707 572	.063 664
50	18.420 154	290.335 905	.003 444	.054 288	15.761 861	.063 444
51	19.525 364	308.756 059	.003 239	.051 215	15.813 076	.063 239
52	20.696 885	328.281 422	.003 046	.048 316	15.861 393	.063 046
53	21.938 698	348.978 308	.002 866	.045 582	15.906 974	.062 866
54	23.255 020	370.917 006	.002 696	.043 001	15.949 976	.062 696
55	24.650 322	394.172 027	.002 537	.040 567	15.990 543	.062 537
56	26.129 341	418.822 348	.002 388	.038 271	16.028 814	.062 388
57	27.697 101	444.951 689	.002 247	.036 105	16.064 919	.062 247
58	29.358 927	472.648 790	.002 116	.034 061	16.098 980	.062 116
59	31.120 463	502.007 718	.001 992	.032 133	16.131 113	.061 992
60	32.987 691	533.128 181	.001 876	.030 314	16.161 428	.061 876

$S^n = (1+i)^n$	$S_{\overline{n}|} = \frac{S^n - 1}{i}$	$1/S_{\overline{n}|} = \frac{i_y}{S^n - 1}$	$V^n = \frac{1}{S^n}$	$A_{\overline{n}|} = \frac{1 - 1/S^n}{i}$	$\frac{1}{A_{\overline{n}|}} = \frac{i}{1 - 1/S^n}$

YEARS	1 AMOUNT OF ONE	2 AMOUNT OF ONE PER PERIOD	3 SINKING FUND FACTOR	4 PRESENT WORTH OF ONE	5 PRESENT WORTH ONE PER PERIOD	6 PARTIAL PAYMENT
1	1.062 500	1.000 000	1.000 000	.941 176	.941 176	1.062 500
2	1.128 906	2.062 500	.484 848	.885 813	1.826 990	.547 348
3	1.199 463	3.191 406	.313 341	.833 706	2.660 696	.375 841
4	1.274 429	4.390 869	.227 745	.784 665	3.445 361	.290 245
5	1.354 081	5.665 298	.176 513	.738 508	4.183 869	.239 013
6	1.438 711	7.019 380	.142 463	.695 067	4.878 936	.204 963
7	1.528 631	8.458 091	.118 230	.654 180	5.533 116	.180 730
8	1.624 170	9.986 722	.100 133	.615 699	6.148 815	.162 633
9	1.725 681	11.610 892	.086 126	.579 481	6.728 297	.148 626
10	1.833 536	13.336 572	.074 982	.545 394	7.273 691	.137 482
11	1.948 132	15.170 108	.065 919	.513 312	7.787 003	.128 419
12	2.069 890	17.118 240	.058 417	.483 117	8.270 121	.120 917
13	2.199 258	19.188 130	.052 116	.454 699	8.724 819	.114 616
14	2.336 712	21.387 388	.046 757	.427 952	9.152 771	.109 257
15	2.482 756	23.724 100	.042 151	.402 778	9.555 549	.104 651
16	2.637 928	26.206 856	.038 158	.379 085	9.934 635	.100 658
17	2.802 799	28.844 784	.034 668	.356 786	10.291 421	.097 168
18	2.977 974	31.647 583	.031 598	.335 799	10.627 220	.094 098
19	3.164 097	34.625 557	.028 880	.316 046	10.943 266	.091 380
20	3.361 853	37.789 655	.026 462	.297 455	11.240 721	.088 962
21	3.571 969	41.151 508	.024 300	.279 958	11.520 678	.086 800
22	3.795 217	44.723 477	.022 360	.263 490	11.784 168	.084 860
23	4.032 418	48.518 695	.020 611	.247 990	12.032 158	.083 111
24	4.284 445	52.551 113	.019 029	.233 402	12.265 560	.081 529
25	4.552 222	56.835 558	.017 595	.219 673	12.485 233	.080 095
26	4.836 736	61.387 780	.016 290	.206 751	12.691 984	.078 790
27	5.139 032	66.224 516	.015 100	.194 589	12.886 573	.077 600
28	5.460 222	71.363 549	.014 013	.183 143	13.069 716	.076 513
29	5.801 486	76.823 771	.013 017	.172 370	13.242 086	.075 517
30	6.164 079	82.625 256	.012 103	.162 230	13.404 316	.074 603
31	6.549 333	88.789 335	.011 263	.152 687	13.557 003	.073 763
32	6.958 667	95.338 668	.010 489	.143 706	13.700 709	.072 989
33	7.393 583	102.297 335	.009 775	.135 252	13.835 961	.072 275
34	7.855 682	109.690 918	.009 117	.127 296	13.963 258	.071 617
35	8.346 663	117.546 601	.008 507	.119 808	14.083 066	.071 007
36	8.868 329	125.893 263	.007 943	.112 761	14.195 827	.070 443
37	9.422 600	134.761 592	.007 421	.106 128	14.301 955	.069 921
38	10.011 512	144.184 192	.006 936	.099 885	14.401 840	.069 436
39	10.637 231	154.195 704	.006 485	.094 009	14.495 849	.068 985
40	11.302 058	164.832 935	.006 067	.088 479	14.584 329	.068 567
41	12.008 437	176.134 994	.005 677	.083 275	14.667 603	.068 177
42	12.758 964	188.143 431	.005 315	.078 376	14.745 980	.067 815
43	13.556 400	200.902 395	.004 978	.073 766	14.819 746	.067 478
44	14.403 675	214.458 795	.004 663	.069 427	14.889 172	.067 163
45	15.303 904	228.862 470	.004 369	.065 343	14.954 515	.066 869
46	16.260 398	244.166 374	.004 096	.061 499	15.016 014	.066 596
47	17.276 673	260.426 772	.003 840	.057 882	15.073 896	.066 340
48	18.356 465	277.703 445	.003 601	.054 477	15.128 372	.066 101
49	19.503 744	296.059 911	.003 378	.051 272	15.179 645	.065 878
50	20.722 728	315.563 655	.003 169	.048 256	15.227 901	.065 669
51	22.017 899	336.286 384	.002 974	.045 418	15.273 318	.065 474
52	23.394 018	358.304 283	.002 791	.042 746	15.316 064	.065 291
53	24.856 144	381.698 300	.002 620	.040 232	15.356 296	.065 120
54	26.409 653	406.554 444	.002 460	.037 865	15.394 161	.064 960
55	28.060 256	432.964 097	.002 310	.035 638	15.429 799	.064 810
56	29.814 022	461.024 353	.002 169	.033 541	15.463 340	.064 669
57	31.677 398	490.838 375	.002 037	.031 568	15.494 908	.064 537
58	33.657 236	522.515 773	.001 914	.029 711	15.524 619	.064 414
59	35.760 813	556.173 009	.001 798	.027 964	15.552 583	.064 298
60	37.995 864	591.933 822	.001 689	.026 319	15.578 902	.064 189
	$S^n = (1+i)^n$	$S_{\overline{n}|} = \frac{S^n - 1}{i}$	$1/S_{\overline{n}|} = \frac{i}{S^n - 1}$	$V^n = \frac{1}{S^n}$	$A_{\overline{n}|} = \frac{1 - 1/S^n}{i}$	$\frac{1}{A_{\overline{n}|}} = \frac{i}{1 - 1/S^n}$

YEARS	1 AMOUNT OF ONE	2 AMOUNT OF ONE PER PERIOD	3 SINKING FUND FACTOR	4 PRESENT WORTH OF ONE	5 PRESENT WORTH ONE PER PERIOD	6 PARTIAL PAYMENT
1	1.065 000	1.000 000	1.000 000	.938 967	.938 967	1.065 000
2	1.134 225	2.065 000	.484 262	.881 659	1.820 626	.549 262
3	1.207 950	3.199 225	.312 576	.827 849	2.648 476	.377 576
4	1.286 466	4.407 175	.226 903	.777 323	3.425 799	.291 903
5	1.370 087	5.693 641	.175 635	.729 881	4.155 679	.240 635
6	1.459 142	7.063 728	.141 568	.685 334	4.841 014	.206 568
7	1.553 987	8.522 870	.117 331	.643 506	5.484 520	.182 331
8	1.654 996	10.076 856	.099 237	.604 231	6.088 751	.164 237
9	1.762 570	11.731 852	.085 238	.567 353	6.656 104	.150 238
10	1.877 137	13.494 423	.074 105	.532 726	7.188 830	.139 105
11	1.999 151	15.371 560	.065 055	.500 212	7.689 042	.130 055
12	2.129 096	17.370 711	.057 568	.469 683	8.158 725	.122 568
13	2.267 487	19.499 808	.051 283	.441 017	8.599 742	.116 283
14	2.414 874	21.767 295	.045 940	.414 100	9.013 842	.110 940
15	2.571 841	24.182 169	.041 353	.388 827	9.402 669	.106 353
16	2.739 011	26.754 010	.037 378	.365 095	9.767 764	.102 378
17	2.917 046	29.493 021	.033 906	.342 813	10.110 577	.098 906
18	3.106 654	32.410 067	.030 855	.321 890	10.432 466	.095 855
19	3.308 587	35.516 722	.028 156	.302 244	10.734 710	.093 156
20	3.523 645	38.825 309	.025 756	.283 797	11.018 507	.090 756
21	3.752 682	42.348 954	.023 613	.266 476	11.284 983	.088 613
22	3.996 606	46.101 636	.021 691	.250 212	11.535 196	.086 691
23	4.256 386	50.098 242	.019 961	.234 941	11.770 137	.084 961
24	4.533 051	54.354 628	.018 398	.220 602	11.990 739	.083 398
25	4.827 699	58.887 679	.016 981	.207 138	12.197 877	.081 981
26	5.141 500	63.715 378	.015 695	.194 496	12.392 373	.080 695
27	5.475 697	68.856 877	.014 523	.182 625	12.574 998	.079 523
28	5.831 617	74.332 574	.013 453	.171 479	12.746 477	.078 453
29	6.210 672	80.164 192	.012 474	.161 013	12.907 490	.077 474
30	6.614 366	86.374 864	.011 577	.151 186	13.058 676	.076 577
31	7.044 300	92.989 230	.010 754	.141 959	13.200 635	.075 754
32	7.502 179	100.033 530	.009 997	.133 295	13.333 929	.074 997
33	7.989 821	107.535 710	.009 299	.125 159	13.459 088	.074 299
34	8.509 159	115.525 531	.008 656	.117 520	13.576 609	.073 656
35	9.062 255	124.034 690	.008 062	.110 348	13.686 957	.073 062
36	9.651 301	133.096 945	.007 513	.103 613	13.790 570	.072 513
37	10.278 636	142.748 247	.007 005	.097 289	13.887 859	.072 005
38	10.946 747	153.026 883	.006 535	.091 351	13.979 210	.071 535
39	11.658 286	163.973 630	.006 099	.085 776	14.064 986	.071 099
40	12.416 075	175.631 916	.005 694	.080 541	14.145 527	.070 694
41	13.223 119	188.047 990	.005 318	.075 625	14.221 152	.070 318
42	14.082 622	201.271 110	.004 968	.071 010	14.292 161	.069 968
43	14.997 993	215.353 732	.004 644	.066 676	14.358 837	.069 644
44	15.972 862	230.351 725	.004 341	.062 606	14.421 443	.069 341
45	17.011 098	246.324 587	.004 060	.058 785	14.480 228	.069 060
46	18.116 820	263.335 685	.003 797	.055 197	14.535 426	.068 797
47	19.294 413	281.452 504	.003 553	.051 828	14.587 254	.068 553
48	20.548 550	300.746 917	.003 325	.048 665	14.635 919	.068 325
49	21.884 205	321.295 467	.003 112	.045 695	14.681 615	.068 112
50	23.306 679	343.179 672	.002 914	.042 906	14.724 521	.067 914
51	24.821 613	366.486 351	.002 729	.040 287	14.764 808	.067 729
52	26.435 018	391.307 963	.002 556	.037 829	14.802 637	.067 556
53	28.153 294	417.742 981	.002 394	.035 520	14.838 157	.067 394
54	29.983 258	445.896 275	.002 243	.033 352	14.871 509	.067 243
55	31.932 170	475.879 533	.002 101	.031 316	14.902 825	.067 101
56	34.007 761	507.811 702	.001 969	.029 405	14.932 230	.066 969
57	36.218 265	541.819 463	.001 846	.027 610	14.959 840	.066 846
58	38.572 452	578.037 728	.001 730	.025 925	14.985 766	.066 730
59	41.079 662	616.610 180	.001 622	.024 343	15.010 109	.066 622
60	43.749 840	657.689 842	.001 520	.022 857	15.032 966	.066 520
	$S^n = (1+i)^n$	$S_{\overline{n}|} = \frac{S^n - 1}{i}$	$1/S_{\overline{n}|} = \frac{i}{S^n - 1}$	$V^n = \frac{1}{S^n}$	$A_{\overline{n}|} = \frac{1 - 1/S^n}{i}$	$\frac{1}{A_{\overline{n}|}} = \frac{i}{1 - 1/S^n}$

YEARS	1 AMOUNT OF ONE	2 AMOUNT OF ONE PER PERIOD	3 SINKING FUND FACTOR	4 PRESENT WORTH OF ONE	5 PRESENT WORTH ONE PER PERIOD	6 PARTIAL PAYMENT
1	1.067 500	1.000 000	1.000 000	.936 768	.936 768	1.067 500
2	1.139 556	2.067 500	.483 676	.877 535	1.814 303	.551 176
3	1.216 476	3.207 056	.311 812	.822 046	2.636 349	.379 312
4	1.298 588	4.423 533	.226 064	.770 067	3.406 416	.293 564
5	1.386 243	5.722 121	.174 760	.721 374	4.127 790	.242 260
6	1.479 815	7.108 364	.140 679	.675 760	4.803 551	.208 179
7	1.579 702	8.588 179	.116 439	.633 031	5.436 581	.183 939
8	1.686 332	10.167 881	.098 349	.593 003	6.029 584	.165 849
9	1.800 159	11.854 213	.084 358	.555 506	6.585 091	.151 858
10	1.921 670	13.654 372	.073 237	.520 381	7.105 471	.140 737
11	2.051 383	15.576 042	.064 201	.487 476	7.592 947	.131 701
12	2.189 851	17.627 425	.056 730	.456 652	8.049 600	.124 230
13	2.337 666	19.817 276	.050 461	.427 777	8.477 377	.117 961
14	2.495 459	22.154 942	.045 137	.400 728	8.878 105	.112 637
15	2.663 902	24.650 401	.040 567	.375 389	9.253 494	.108 067
16	2.843 715	27.314 303	.036 611	.351 653	9.605 146	.104 111
17	3.035 666	30.158 019	.033 159	.329 417	9.934 563	.100 659
18	3.240 574	33.193 685	.030 126	.308 587	10.243 151	.097 626
19	3.459 312	36.434 259	.027 447	.289 075	10.532 225	.094 947
20	3.692 816	39.893 571	.025 067	.270 796	10.803 021	.092 567
21	3.942 081	43.586 387	.022 943	.253 673	11.056 695	.090 443
22	4.208 172	47.528 468	.021 040	.237 633	11.294 327	.088 540
23	4.492 223	51.736 640	.019 329	.222 607	11.516 934	.086 829
24	4.795 448	56.228 863	.017 784	.208 531	11.725 465	.085 284
25	5.119 141	61.024 311	.016 387	.195 345	11.920 811	.083 887
26	5.464 683	66.143 452	.015 119	.182 993	12.103 804	.082 619
27	5.833 549	71.608 135	.013 965	.171 422	12.275 226	.081 465
28	6.227 314	77.441 684	.012 913	.160 583	12.435 809	.080 413
29	6.647 657	83.668 998	.011 952	.150 429	12.586 238	.079 452
30	7.096 374	90.316 655	.011 072	.140 917	12.727 155	.078 572
31	7.575 380	97.413 030	.010 266	.132 007	12.859 162	.077 766
32	8.086 718	104.988 409	.009 525	.123 660	12.982 821	.077 025
33	8.632 571	113.075 127	.008 844	.115 840	13.098 662	.076 344
34	9.215 270	121.707 698	.008 216	.108 516	13.207 177	.075 716
35	9.837 300	130.922 967	.007 638	.101 654	13.308 831	.075 138
36	10.501 318	140.760 268	.007 104	.095 226	13.404 057	.074 604
37	11.210 157	151.261 586	.006 611	.089 205	13.493 262	.074 111
38	11.966 843	162.471 743	.006 155	.083 564	13.576 826	.073 655
39	12.774 605	174.438 586	.005 733	.078 280	13.655 107	.073 233
40	13.636 890	187.213 190	.005 342	.073 331	13.728 437	.072 842
41	14.557 380	200.850 080	.004 979	.068 694	13.797 131	.072 479
42	15.540 004	215.407 461	.004 642	.064 350	13.861 481	.072 142
43	16.588 954	230.947 464	.004 330	.060 281	13.921 762	.071 830
44	17.708 708	247.536 418	.004 040	.056 469	13.978 231	.071 540
45	18.904 046	265.245 127	.003 770	.052 899	14.031 130	.071 270
46	20.180 069	284.149 173	.003 519	.049 554	14.080 684	.071 019
47	21.542 224	304.329 242	.003 286	.046 420	14.127 104	.070 786
48	22.996 324	325.871 466	.003 069	.043 485	14.170 589	.070 569
49	24.548 576	348.867 789	.002 866	.040 736	14.211 325	.070 366
50	26.205 605	373.416 365	.002 678	.038 160	14.249 485	.070 178
51	27.974 483	399.621 970	.002 502	.035 747	14.285 232	.070 002
52	29.862 761	427.596 453	.002 339	.033 487	14.318 718	.069 839
53	31.878 497	457.459 213	.002 186	.031 369	14.350 087	.069 686
54	34.030 295	489.337 710	.002 044	.029 386	14.379 473	.069 544
55	36.327 340	523.368 006	.001 911	.027 527	14.407 000	.069 411
56	38.779 436	559.695 346	.001 787	.025 787	14.432 787	.069 287
57	41.397 048	598.474 782	.001 671	.024 156	14.456 944	.069 171
58	44.191 349	639.871 830	.001 563	.022 629	14.479 572	.069 063
59	47.174 265	684.063 178	.001 462	.021 198	14.500 770	.068 962
60	50.358 527	731.237 443	.001 368	.019 858	14.520 628	.068 868
	$S^n = (1+i)^n$	$S_{\overline{n}|} = \frac{S^n - 1}{i}$	$1/S_{\overline{n}|} = \frac{i}{S^n - 1}$	$V^n = \frac{1}{S^n}$	$A_{\overline{n}|} = \frac{1 - 1/S^n}{i}$	$\frac{1}{A_{\overline{n}|}} = \frac{i}{1 - 1/S^n}$

YEARS	1 AMOUNT OF ONE	2 AMOUNT OF ONE PER PERIOD	3 SINKING FUND FACTOR	4 PRESENT WORTH OF ONE	5 PRESENT WORTH ONE PER PERIOD	6 PARTIAL PAYMENT
1	1.070 000	1.000 000	1.000 000	.934 579	.934 579	1.070 000
2	1.144 900	2.070 000	.483 092	.873 439	1.808 018	.553 092
3	1.225 043	3.214 900	.311 052	.816 298	2.624 316	.381 052
4	1.310 796	4.439 943	.225 228	.762 895	3.387 211	.295 228
5	1.402 552	5.750 739	.173 891	.712 986	4.100 197	.243 891
6	1.500 730	7.153 291	.139 796	.666 342	4.766 540	.209 796
7	1.605 781	8.654 021	.115 553	.622 750	5.389 289	.185 553
8	1.718 186	10.259 803	.097 468	.582 009	5.971 299	.167 468
9	1.838 459	11.977 989	.083 486	.543 934	6.515 232	.153 486
10	1.967 151	13.816 448	.072 378	.508 349	7.023 582	.142 378
11	2.104 852	15.783 599	.063 357	.475 093	7.498 674	.133 357
12	2.252 192	17.888 451	.055 902	.444 012	7.942 686	.125 902
13	2.409 845	20.140 643	.049 651	.414 964	8.357 651	.119 651
14	2.578 534	22.550 488	.044 345	.387 817	8.745 468	.114 345
15	2.759 032	25.129 022	.039 795	.362 446	9.107 914	.109 795
16	2.952 164	27.888 054	.035 858	.338 735	9.446 649	.105 858
17	3.158 815	30.840 217	.032 425	.316 574	9.763 223	.102 425
18	3.379 932	33.999 033	.029 413	.295 864	10.059 087	.099 413
19	3.616 528	37.378 965	.026 753	.276 508	10.335 595	.096 753
20	3.869 684	40.995 492	.024 393	.258 419	10.594 014	.094 393
21	4.140 562	44.865 177	.022 289	.241 513	10.835 527	.092 289
22	4.430 402	49.005 739	.020 406	.225 713	11.061 240	.090 406
23	4.740 530	53.436 141	.018 714	.210 947	11.272 187	.088 714
24	5.072 367	58.176 671	.017 189	.197 147	11.469 334	.087 189
25	5.427 433	63.249 038	.015 811	.184 249	11.653 583	.085 811
26	5.807 353	68.676 470	.014 561	.172 195	11.825 779	.084 561
27	6.213 868	74.483 823	.013 426	.160 930	11.986 709	.083 426
28	6.648 838	80.697 691	.012 392	.150 402	12.137 111	.082 392
29	7.114 257	87.346 529	.011 449	.140 563	12.277 674	.081 449
30	7.612 255	94.460 786	.010 586	.131 367	12.409 041	.080 586
31	8.145 113	102.073 041	.009 797	.122 773	12.531 814	.079 797
32	8.715 271	110.218 154	.009 073	.114 741	12.646 555	.079 073
33	9.325 340	118.933 425	.008 408	.107 235	12.753 790	.078 408
34	9.978 114	128.258 765	.007 797	.100 219	12.854 009	.077 797
35	10.676 581	138.236 878	.007 234	.093 663	12.947 672	.077 234
36	11.423 942	148.913 460	.006 715	.087 535	13.035 208	.076 715
37	12.223 618	160.337 402	.006 237	.081 809	13.117 017	.076 237
38	13.079 271	172.561 020	.005 795	.076 457	13.193 473	.075 795
39	13.994 820	185.640 292	.005 387	.071 455	13.264 928	.075 387
40	14.974 458	199.635 112	.005 009	.066 780	13.331 709	.075 009
41	16.022 670	214.609 570	.004 660	.062 412	13.394 120	.074 660
42	17.144 257	230.632 240	.004 336	.058 329	13.452 449	.074 336
43	18.344 355	247.776 496	.004 036	.054 513	13.506 962	.074 036
44	19.628 460	266.120 851	.003 758	.050 946	13.557 908	.073 758
45	21.002 452	285.749 311	.003 500	.047 613	13.605 522	.073 500
46	22.472 623	306.751 763	.003 260	.044 499	13.650 020	.073 260
47	24.045 707	329.224 386	.003 037	.041 587	13.691 608	.073 037
48	25.728 907	353.270 093	.002 831	.038 867	13.730 474	.072 831
49	27.529 930	378.999 000	.002 639	.036 324	13.766 799	.072 639
50	29.457 025	406.528 929	.002 460	.033 948	13.800 746	.072 460
51	31.519 017	435.985 955	.002 294	.031 727	13.832 473	.072 294
52	33.725 348	467.504 971	.002 139	.029 651	13.862 124	.072 139
53	36.086 122	501.230 319	.001 995	.027 711	13.889 836	.071 995
54	38.612 151	537.316 442	.001 861	.025 899	13.915 735	.071 861
55	41.315 001	575.928 593	.001 736	.024 204	13.939 939	.071 736
56	44.207 052	617.243 594	.001 620	.022 621	13.962 560	.071 620
57	47.301 545	661.450 646	.001 512	.021 141	13.983 701	.071 512
58	50.612 653	708.752 191	.001 411	.019 758	14.003 458	.071 411
59	54.155 539	759.364 844	.001 317	.018 465	14.021 924	.071 317
60	57.946 427	813.520 383	.001 229	.017 257	14.039 181	.071 229
	$S^n = (1+i)^n$	$S_{\overline{n}|} = \frac{S^n - 1}{i}$	$1/S_{\overline{n}|} = \frac{i}{S^n - 1}$	$V^n = \frac{1}{S^n}$	$A_{\overline{n}|} = \frac{1 - 1/S^n}{i}$	$\frac{1}{A_{\overline{n}|}} = \frac{i}{1 - 1/S^n}$

YEARS	1 AMOUNT OF ONE	2 AMOUNT OF ONE PER PERIOD	3 SINKING FUND FACTOR	4 PRESENT WORTH OF ONE	5 PRESENT WORTH ONE PER PERIOD	6 PARTIAL PAYMENT
1	1.072 500	1.000 000	1.000 000	.932 401	.932 401	1.072 500
2	1.150 256	2.072 500	.482 509	.869 371	1.801 772	.555 009
3	1.233 650	3.222 756	.310 293	.810 603	2.612 375	.382 793
4	1.323 089	4.456 406	.224 396	.755 807	3.368 182	.296 896
5	1.419 013	5.779 496	.173 025	.704 715	4.072 897	.245 525
6	1.521 892	7.198 509	.138 918	.657 077	4.729 974	.211 418
7	1.632 229	8.720 401	.114 674	.612 659	5.342 633	.187 174
8	1.750 566	10.352 630	.096 594	.571 244	5.913 877	.169 094
9	1.877 482	12.103 196	.082 623	.532 628	6.446 505	.155 123
10	2.013 599	13.980 677	.071 527	.496 623	6.943 128	.144 027
11	2.159 585	15.994 276	.062 522	.463 052	7.406 180	.135 022
12	2.316 155	18.153 861	.055 085	.431 750	7.837 930	.127 585
13	2.484 076	20.470 016	.048 852	.402 564	8.240 495	.121 352
14	2.664 172	22.954 093	.043 565	.375 351	8.615 846	.116 065
15	2.857 324	25.618 264	.039 035	.349 978	8.965 824	.111 535
16	3.064 480	28.475 588	.035 118	.326 320	9.292 143	.107 618
17	3.286 655	31.540 069	.031 706	.304 261	9.596 404	.104 206
18	3.524 937	34.826 724	.028 714	.283 693	9.880 097	.101 214
19	3.780 495	38.351 661	.026 074	.264 516	10.144 612	.098 574
20	4.054 581	42.132 156	.023 735	.246 635	10.391 247	.096 235
21	4.348 538	46.186 738	.021 651	.229 962	10.621 209	.094 151
22	4.663 808	50.535 276	.019 788	.214 417	10.835 626	.092 288
23	5.001 934	55.199 084	.018 116	.199 923	11.035 549	.090 616
24	5.364 574	60.201 017	.016 611	.186 408	11.221 957	.089 111
25	5.753 505	65.565 591	.015 252	.173 807	11.395 764	.087 752
26	6.170 634	71.319 096	.014 021	.162 058	11.557 822	.086 521
27	6.618 005	77.489 731	.012 905	.151 103	11.708 925	.085 405
28	7.097 811	84.107 736	.011 890	.140 889	11.849 814	.084 390
29	7.612 402	91.205 547	.010 964	.131 365	11.981 178	.083 464
30	8.164 301	98.817 949	.010 120	.122 484	12.103 663	.082 620
31	8.756 213	106.982 251	.009 347	.114 205	12.217 867	.081 847
32	9.391 039	115.738 464	.008 640	.106 484	12.324 352	.081 140
33	10.071 889	125.129 503	.007 992	.099 286	12.423 638	.080 492
34	10.802 101	135.201 392	.007 396	.092 575	12.516 213	.079 896
35	11.585 253	146.003 492	.006 849	.086 317	12.602 529	.079 349
36	12.425 184	157.588 746	.006 346	.080 482	12.683 011	.078 846
37	13.326 010	170.013 930	.005 882	.075 041	12.758 052	.078 382
38	14.292 146	183.339 940	.005 454	.069 969	12.828 021	.077 954
39	15.328 326	197.632 085	.005 060	.065 239	12.893 259	.077 560
40	16.439 630	212.960 411	.004 696	.060 829	12.954 088	.077 196
41	17.631 503	229.400 041	.004 359	.056 717	13.010 805	.076 859
42	18.909 787	247.031 544	.004 048	.052 883	13.063 687	.076 548
43	20.280 747	265.941 331	.003 760	.049 308	13.112 995	.076 260
44	21.751 101	286.222 078	.003 494	.045 975	13.158 970	.075 994
45	23.328 055	307.973 178	.003 247	.042 867	13.201 837	.075 747
46	25.019 339	331.301 234	.003 018	.039 969	13.241 806	.075 518
47	26.833 242	356.320 573	.002 806	.037 267	13.279 073	.075 306
48	28.778 652	383.153 815	.002 610	.034 748	13.313 821	.075 110
49	30.865 104	411.932 466	.002 428	.032 399	13.346 220	.074 928
50	33.102 824	442.797 570	.002 258	.030 209	13.376 429	.074 758
51	35.502 779	475.900 394	.002 101	.028 167	13.404 596	.074 601
52	38.076 730	511.403 173	.001 955	.026 263	13.430 858	.074 455
53	40.837 293	549.479 903	.001 820	.024 487	13.455 346	.074 320
54	43.797 997	590.317 195	.001 694	.022 832	13.478 178	.074 194
55	46.973 351	634.115 192	.001 577	.021 289	13.499 467	.074 077
56	50.378 919	681.088 544	.001 468	.019 850	13.519 316	.073 968
57	54.031 391	731.467 463	.001 367	.018 508	13.537 824	.073 867
58	57.948 667	785.498 854	.001 273	.017 257	13.555 081	.073 773
59	62.149 945	843.447 521	.001 186	.016 090	13.571 171	.073 686
60	66.655 816	905.597 466	.001 104	.015 002	13.586 173	.073 604
	$S^n = (1+i)^n$	$S_{\overline{n}|} = \frac{S^n - 1}{i}$	$1/S_{\overline{n}|} = \frac{i}{S^n - 1}$	$V^n = \frac{1}{S^n}$	$A_{\overline{n}|} = \frac{1 - 1/S^n}{i}$	$\frac{1}{A_{\overline{n}|}} = \frac{i}{1 - 1/S^n}$

YEARS	1 AMOUNT OF ONE	2 AMOUNT OF ONE PER PERIOD	3 SINKING FUND FACTOR	4 PRESENT WORTH OF ONE	5 PRESENT WORTH ONE PER PERIOD	6 PARTIAL PAYMENT
1	1.075 000	1.000 000	1.000 000	.930 233	.930 233	1.075 000
2	1.155 625	2.075 000	.481 928	.865 333	1.795 565	.556 928
3	1.242 297	3.230 625	.309 538	.804 961	2.600 526	.384 538
4	1.335 469	4.472 922	.223 568	.748 801	3.349 326	.298 568
5	1.435 629	5.808 391	.172 165	.696 559	4.045 885	.247 165
6	1.543 302	7.244 020	.138 045	.647 962	4.693 846	.213 045
7	1.659 049	8.787 322	.113 800	.602 755	5.296 601	.188 800
8	1.783 478	10.446 371	.095 727	.560 702	5.857 304	.170 727
9	1.917 239	12.229 849	.081 767	.521 583	6.378 887	.156 767
10	2.061 032	14.147 087	.070 686	.485 194	6.864 081	.145 686
11	2.215 609	16.208 119	.061 697	.451 343	7.315 424	.136 697
12	2.381 780	18.423 728	.054 278	.419 854	7.735 278	.129 278
13	2.560 413	20.805 508	.048 064	.390 562	8.125 840	.123 064
14	2.752 444	23.365 921	.042 797	.363 313	8.489 154	.117 797
15	2.958 877	26.118 365	.038 287	.337 966	8.827 120	.113 287
16	3.180 793	29.077 242	.034 391	.314 387	9.141 507	.109 391
17	3.419 353	32.258 035	.031 000	.292 453	9.433 960	.106 000
18	3.675 804	35.677 388	.028 029	.272 049	9.706 009	.103 029
19	3.951 489	39.353 192	.025 411	.253 069	9.959 078	.100 411
20	4.247 851	43.304 681	.023 092	.235 413	10.194 491	.098 092
21	4.566 440	47.552 532	.021 029	.218 989	10.413 480	.096 029
22	4.908 923	52.118 972	.019 187	.203 711	10.617 191	.094 187
23	5.277 092	57.027 895	.017 535	.189 498	10.806 689	.092 535
24	5.672 874	62.304 987	.016 050	.176 277	10.982 967	.091 050
25	6.098 340	67.977 862	.014 711	.163 979	11.146 946	.089 711
26	6.555 715	74.076 201	.013 500	.152 539	11.299 485	.088 500
27	7.047 394	80.631 916	.012 402	.141 896	11.441 381	.087 402
28	7.575 948	87.679 310	.011 405	.131 997	11.573 378	.086 405
29	8.144 144	95.255 258	.010 498	.122 788	11.696 165	.085 498
30	8.754 955	103.399 403	.009 671	.114 221	11.810 386	.084 671
31	9.411 577	112.154 358	.008 916	.106 252	11.916 638	.083 916
32	10.117 445	121.565 935	.008 226	.098 839	12.015 478	.083 226
33	10.876 253	131.683 380	.007 594	.091 943	12.107 421	.082 594
34	11.691 972	142.559 633	.007 015	.085 529	12.192 950	.082 015
35	12.568 870	154.251 606	.006 483	.079 562	12.272 511	.081 483
36	13.511 536	166.820 476	.005 994	.074 011	12.346 522	.080 994
37	14.524 901	180.332 012	.005 545	.068 847	12.415 370	.080 545
38	15.614 268	194.856 913	.005 132	.064 044	12.479 414	.080 132
39	16.785 339	210.471 181	.004 751	.059 576	12.538 989	.079 751
40	18.044 239	227.256 520	.004 400	.055 419	12.594 409	.079 400
41	19.397 557	245.300 759	.004 077	.051 553	12.645 962	.079 077
42	20.852 374	264.698 315	.003 778	.047 956	12.693 918	.078 778
43	22.416 302	285.550 689	.003 502	.044 610	12.738 528	.078 502
44	24.097 524	307.966 991	.003 247	.041 498	12.780 026	.078 247
45	25.904 839	332.064 515	.003 011	.038 603	12.818 629	.078 011
46	27.847 702	357.969 354	.002 794	.035 910	12.854 539	.077 794
47	29.936 279	385.817 055	.002 592	.033 404	12.887 943	.077 592
48	32.181 500	415.753 334	.002 405	.031 074	12.919 017	.077 405
49	34.595 113	447.934 835	.002 232	.028 906	12.947 922	.077 232
50	37.189 746	482.529 947	.002 072	.026 889	12.974 812	.077 072
51	39.978 977	519.719 693	.001 924	.025 013	12.999 825	.076 924
52	42.977 400	559.698 670	.001 787	.023 268	13.023 093	.076 787
53	46.200 705	602.676 070	.001 659	.021 645	13.044 737	.076 659
54	49.665 758	648.876 776	.001 541	.020 135	13.064 872	.076 541
55	53.390 690	698.542 534	.001 432	.018 730	13.083 602	.076 432
56	57.394 992	751.933 224	.001 330	.017 423	13.101 025	.076 330
57	61.699 616	809.328 216	.001 236	.016 208	13.117 233	.076 236
58	66.327 087	871.027 832	.001 148	.015 077	13.132 309	.076 148
59	71.301 619	937.354 919	.001 067	.014 025	13.146 334	.076 067
60	76.649 240	1008.656 538	.000 991	.013 046	13.159 381	.075 991
	$S^n = (1+i)^n$	$S_{\overline{n}|} = \frac{S^n - 1}{i}$	$1/S_{\overline{n}|} = \frac{i}{S^n - 1}$	$V^n = \frac{1}{S^n}$	$A_{\overline{n}|} = \frac{1 - 1/S^n}{i}$	$\frac{1}{A_{\overline{n}|}} = \frac{i}{1 - 1/S^n}$

YEARS	1 AMOUNT OF ONE	2 AMOUNT OF ONE PER PERIOD	3 SINKING FUND FACTOR	4 PRESENT WORTH OF ONE	5 PRESENT WORTH ONE PER PERIOD	6 PARTIAL PAYMENT
1	1.077 500	1.000 000	1.000 000	.928 074	.928 074	1.077 500
2	1.161 006	2.077 500	.481 348	.861 322	1.789 396	.558 848
3	1.250 984	3.238 506	.308 784	.799 371	2.588 767	.386 284
4	1.347 936	4.489 490	.222 742	.741 875	3.330 642	.300 242
5	1.452 401	5.837 426	.171 308	.688 515	4.019 157	.248 808
6	1.564 962	7.289 827	.137 177	.638 993	4.658 151	.214 677
7	1.686 246	8.854 788	.112 933	.593 033	5.251 184	.190 433
8	1.816 930	10.541 034	.094 867	.550 379	5.801 563	.172 367
9	1.957 742	12.357 964	.080 919	.510 792	6.312 355	.158 419
10	2.109 467	14.315 707	.069 853	.474 053	6.786 409	.147 353
11	2.272 951	16.425 174	.060 882	.439 957	7.226 365	.138 382
12	2.449 105	18.698 125	.053 481	.408 312	7.634 678	.130 981
13	2.638 910	21.147 229	.047 288	.378 944	8.013 622	.124 788
14	2.843 426	23.786 140	.042 041	.351 688	8.365 310	.119 541
15	3.063 791	26.629 566	.037 552	.326 393	8.691 703	.115 052
16	3.301 235	29.693 357	.033 678	.302 917	8.994 620	.111 178
17	3.557 081	32.994 592	.030 308	.281 129	9.275 750	.107 808
18	3.832 755	36.551 673	.027 359	.260 909	9.536 659	.104 859
19	4.129 793	40.384 428	.024 762	.242 143	9.778 802	.102 262
20	4.449 852	44.514 221	.022 465	.224 727	10.003 528	.099 965
21	4.794 716	48.964 073	.020 423	.208 563	10.212 091	.097 923
22	5.166 306	53.758 788	.018 602	.193 562	10.405 653	.096 102
23	5.566 695	58.925 095	.016 971	.179 640	10.585 293	.094 471
24	5.998 114	64.491 789	.015 506	.166 719	10.752 012	.093 006
25	6.462 967	70.489 903	.014 186	.154 728	10.906 740	.091 686
26	6.963 847	76.952 870	.012 995	.143 599	11.050 338	.090 495
27	7.503 546	83.916 718	.011 917	.133 270	11.183 609	.089 417
28	8.085 070	91.420 264	.010 938	.123 685	11.307 293	.088 438
29	8.711 663	99.505 334	.010 050	.114 789	11.422 082	.087 550
30	9.386 817	108.216 997	.009 241	.106 532	11.528 614	.086 741
31	10.114 296	117.603 815	.008 503	.098 870	11.627 484	.086 003
32	10.898 154	127.718 110	.007 830	.091 759	11.719 243	.085 330
33	11.742 760	138.616 264	.007 214	.085 159	11.804 402	.084 714
34	12.652 824	150.359 024	.006 651	.079 034	11.883 436	.084 151
35	13.633 418	163.011 849	.006 135	.073 349	11.956 785	.083 635
36	14.690 008	176.645 267	.005 661	.068 073	12.024 858	.083 161
37	15.828 484	191.335 275	.005 226	.063 177	12.088 036	.082 726
38	17.055 191	207.163 759	.004 827	.058 633	12.146 669	.082 327
39	18.376 969	224.218 950	.004 460	.054 416	12.201 085	.081 960
40	19.801 184	242.595 919	.004 122	.050 502	12.251 587	.081 622
41	21.335 775	262.397 103	.003 811	.046 870	12.298 456	.081 311
42	22.989 298	283.732 878	.003 524	.043 499	12.341 955	.081 024
43	24.770 969	306.722 176	.003 260	.040 370	12.382 325	.080 760
44	26.690 719	331.493 145	.003 017	.037 466	12.419 791	.080 517
45	28.759 249	358.183 864	.002 792	.034 771	12.454 562	.080 292
46	30.988 091	386.943 113	.002 584	.032 270	12.486 833	.080 084
47	33.389 668	417.931 204	.002 393	.029 949	12.516 782	.079 893
48	35.977 368	451.320 873	.002 216	.027 795	12.544 577	.079 716
49	38.765 614	487.298 240	.002 052	.025 796	12.570 373	.079 552
50	41.769 949	526.063 854	.001 901	.023 941	12.594 314	.079 401
51	45.007 120	567.833 803	.001 761	.022 219	12.616 533	.079 261
52	48.495 171	612.840 922	.001 632	.020 621	12.637 153	.079 132
53	52.253 547	661.336 094	.001 512	.019 137	12.656 291	.079 012
54	56.303 197	713.589 641	.001 401	.017 761	12.674 052	.078 901
55	60.666 695	769.892 838	.001 299	.016 484	12.690 535	.078 799
56	65.368 364	830.559 533	.001 204	.015 298	12.705 833	.078 704
57	70.434 412	895.927 897	.001 116	.014 198	12.720 031	.078 616
58	75.893 079	966.362 309	.001 035	.013 176	12.733 207	.078 535
59	81.774 793	1042.255 388	.000 959	.012 229	12.745 436	.078 459
60	88.112 339	1124.030 180	.000 890	.011 349	12.756 785	.078 390
	$S^n = (1+i)^n$	$S_{\overline{n}|} = \frac{S^n - 1}{i}$	$1/S_{\overline{n}|} = \frac{i}{S^n - 1}$	$V^n = \frac{1}{S^n}$	$A_{\overline{n}|} = \frac{1 - 1/S^n}{i}$	$\frac{1}{A_{\overline{n}|}} = \frac{i}{1 - 1/S^n}$

ANNUAL TABLE

8%

EFFECTIVE RATE 8% BASE 1.08

YEARS	1 AMOUNT OF ONE	2 AMOUNT OF ONE PER PERIOD	3 SINKING FUND FACTOR	4 PRESENT WORTH OF ONE	5 PRESENT WORTH ONE PER PERIOD	6 PARTIAL PAYMENT
1	1.080 000	1.000 000	1.000 000	.925 926	.925 926	1.080 000
2	1.166 400	2.080 000	.480 769	.857 339	1.783 265	.560 769
3	1.259 712	3.246 400	.308 034	.793 832	2.577 097	.388 034
4	1.360 489	4.506 112	.221 921	.735 030	3.312 127	.301 921
5	1.469 328	5.866 601	.170 456	.680 583	3.992 710	.250 456
6	1.586 874	7.335 929	.136 315	.630 170	4.622 880	.216 315
7	1.713 824	8.922 803	.112 072	.583 490	5.206 370	.192 072
8	1.850 930	10.636 628	.094 015	.540 269	5.746 639	.174 015
9	1.999 005	12.487 558	.080 080	.500 249	6.246 888	.160 080
10	2.158 925	14.486 562	.069 029	.463 193	6.710 081	.149 029
11	2.331 639	16.645 487	.060 076	.428 883	7.138 964	.140 076
12	2.518 170	18.977 126	.052 695	.397 114	7.536 078	.132 695
13	2.719 624	21.495 297	.046 522	.367 698	7.903 776	.126 522
14	2.937 194	24.214 920	.041 297	.340 461	8.244 237	.121 297
15	3.172 169	27.152 114	.036 830	.315 242	8.559 479	.116 830
16	3.425 943	30.324 283	.032 977	.291 890	8.851 369	.112 977
17	3.700 018	33.750 226	.029 629	.270 269	9.121 638	.109 629
18	3.996 019	37.450 244	.026 702	.250 249	9.371 887	.106 702
19	4.315 701	41.446 263	.024 128	.231 712	9.603 599	.104 128
20	4.660 957	45.761 964	.021 852	.214 548	9.818 147	.101 852
21	5.033 834	50.422 921	.019 832	.198 656	10.016 803	.099 832
22	5.436 540	55.456 755	.018 032	.183 941	10.200 744	.098 032
23	5.871 464	60.893 296	.016 422	.170 315	10.371 059	.096 422
24	6.341 181	66.764 759	.014 978	.157 699	10.528 758	.094 978
25	6.848 475	73.105 940	.013 679	.146 018	10.674 776	.093 679
26	7.396 353	79.954 415	.012 507	.135 202	10.809 978	.092 507
27	7.988 061	87.350 768	.011 448	.125 187	10.935 165	.091 448
28	8.627 106	95.338 830	.010 489	.115 914	11.051 078	.090 489
29	9.317 275	103.965 936	.009 619	.107 328	11.158 406	.089 619
30	10.062 657	113.283 211	.008 827	.099 377	11.257 783	.088 827
31	10.867 669	123.345 868	.008 107	.092 016	11.349 799	.088 107
32	11.737 083	134.213 537	.007 451	.085 200	11.434 999	.087 451
33	12.676 050	145.950 620	.006 852	.078 889	11.513 888	.086 852
34	13.690 134	158.626 670	.006 304	.073 045	11.586 934	.086 304
35	14.785 344	172.316 804	.005 803	.067 635	11.654 568	.085 803
36	15.968 172	187.102 148	.005 345	.062 625	11.717 193	.085 345
37	17.245 626	203.070 320	.004 924	.057 986	11.775 179	.084 924
38	18.625 276	220.315 945	.004 539	.053 690	11.828 869	.084 539
39	20.115 298	238.941 221	.004 185	.049 713	11.878 582	.084 185
40	21.724 521	259.056 519	.003 860	.046 031	11.924 613	.083 860
41	23.462 483	280.781 040	.003 561	.042 621	11.967 235	.083 561
42	25.339 482	304.243 523	.003 287	.039 464	12.006 699	.083 287
43	27.366 640	329.583 005	.003 034	.036 541	12.043 240	.083 034
44	29.555 972	356.949 646	.002 802	.033 834	12.077 074	.082 802
45	31.920 449	386.505 617	.002 587	.031 328	12.108 402	.082 587
46	34.474 085	418.426 067	.002 390	.029 007	12.137 409	.082 390
47	37.232 012	452.900 152	.002 208	.026 859	12.164 267	.082 208
48	40.210 573	490.132 164	.002 040	.024 869	12.189 136	.082 040
49	43.427 419	530.342 737	.001 886	.023 027	12.212 163	.081 886
50	46.901 613	573.770 156	.001 743	.021 321	12.233 485	.081 743
51	50.653 742	620.671 769	.001 611	.019 742	12.253 227	.081 611
52	54.706 041	671.325 510	.001 490	.018 280	12.271 506	.081 490
53	59.082 524	726.031 551	.001 377	.016 925	12.288 432	.081 377
54	63.809 126	785.114 075	.001 274	.015 672	12.304 103	.081 274
55	68.913 856	848.923 201	.001 178	.014 511	12.318 614	.081 178
56	74.426 965	917.837 058	.001 090	.013 436	12.332 050	.081 090
57	80.381 122	992.264 022	.001 008	.012 441	12.344 491	.081 008
58	86.811 612	1072.645 144	.000 932	.011 519	12.356 010	.080 932
59	93.756 540	1159.456 755	.000 862	.010 666	12.366 676	.080 862
60	101.257 064	1253.213 296	.000 798	.009 876	12.376 552	.080 798
	$S^n = (1+i)^n$	$S_{\overline{n}|} = \frac{S^n - 1}{i}$	$1/S_{\overline{n}|} = \frac{i}{S^n - 1}$	$V^n = \frac{1}{S^n}$	$A_{\overline{n}|} = \frac{1 - 1/S^n}{i}$	$\frac{1}{A_{\overline{n}|}} = \frac{i}{1 - 1/S^n}$

MONTHLY TABLE

8%

EFFECTIVE RATE ⅔% BASE 1.0066+

MONTHS[1]	1 AMOUNT OF ONE	2 AMOUNT OF ONE PER PERIOD	3 SINKING FUND FACTOR	4 PRESENT WORTH OF ONE	5 PRESENT WORTH ONE PER PERIOD	6 PARTIAL PAYMENT
1	1.006 667	1.000 000	1.000 000	.993 377	.993 377	1.006 667
2	1.013 378	2.006 667	.498 339	.986 799	1.980 176	.505 006
3	1.020 134	3.020 044	.331 121	.980 264	2.960 440	.337 788
4	1.026 935	4.040 178	.247 514	.973 772	3.934 212	.254 181
5	1.033 781	5.067 113	.197 351	.967 323	4.901 535	.204 018
6	1.040 673	6.100 893	.163 910	.960 917	5.862 452	.170 577
7	1.047 610	7.141 566	.140 025	.954 553	6.817 005	.146 692
8	1.054 595	8.189 176	.122 112	.948 232	7.765 237	.128 779
9	1.061 625	9.243 771	.108 181	.941 952	8.707 189	.114 848
10	1.068 703	10.305 396	.097 037	.935 714	9.642 903	.103 703
11	1.075 827	11.374 099	.087 919	.929 517	10.572 420	.094 586
YEARS						
1	1.083 000	12.449 926	.080 322	.923 361	11.495 782	.086 988
2	1.172 888	25.933 190	.038 561	.852 596	22.110 544	.045 227
3	1.270 237	40.535 558	.024 670	.787 255	31.911 806	.031 336
4	1.375 666	56.349 915	.017 746	.726 921	40.961 913	.024 413
5	1.489 846	73.476 856	.013 610	.671 210	49.318 433	.020 276
6	1.613 502	92.025 325	.010 867	.619 770	57.034 522	.017 533
7	1.747 422	112.113 308	.008 920	.572 272	64.159 261	.015 586
8	1.892 457	133.868 583	.007 470	.528 414	70.737 970	.014 137
9	2.049 530	157.429 535	.006 352	.487 917	76.812 497	.013 019
10	2.219 640	182.946 035	.005 466	.450 523	82.421 481	.012 133
11	2.403 869	210.580 392	.004 749	.415 996	87.600 600	.011 415
12	2.603 389	240.508 387	.004 158	.384 115	92.382 800	.010 825
13	2.819 469	272.920 390	.003 664	.354 677	96.798 498	.010 331
14	3.053 484	308.022 574	.003 247	.327 495	100.875 784	.009 913
15	3.306 921	346.038 222	.002 890	.302 396	104.640 592	.009 557
16	3.581 394	387.209 149	.002 583	.279 221	108.116 871	.009 249
17	3.878 648	431.797 244	.002 316	.257 822	111.326 733	.008 983
18	4.200 574	480.086 128	.002 083	.238 063	114.290 596	.008 750
19	4.549 220	532.382 966	.001 878	.219 818	117.027 313	.008 545
20	4.926 803	589.020 416	.001 698	.202 971	119.554 292	.008 364
21	5.335 725	650.358 746	.001 538	.187 416	121.887 606	.008 204
22	5.778 588	716.788 127	.001 395	.173 053	124.042 099	.008 062
23	6.258 207	788.731 114	.001 268	.159 790	126.031 475	.007 935
24	6.777 636	866.645 333	.001 154	.147 544	127.868 388	.007 821
25	7.340 176	951.026 395	.001 051	.136 237	129.564 523	.007 718
26	7.949 407	1042.411 042	.000 959	.125 796	131.130 668	.007 626
27	8.609 204	1141.380 571	.000 876	.116 155	132.576 786	.007 543
28	9.323 763	1248.564 521	.000 801	.107 253	133.912 076	.007 468
29	10.097 631	1364.644 687	.000 733	.099 033	135.145 031	.007 399
30	10.935 730	1490.359 449	.000 671	.091 443	136.283 494	.007 338
31	11.843 390	1626.508 474	.000 615	.084 435	137.334 707	.007 281
32	12.826 385	1773.957 801	.000 564	.077 964	138.305 357	.007 230
33	13.890 969	1933.645 350	.000 517	.071 989	139.201 617	.007 184
34	15.043 913	2106.586 886	.000 475	.066 472	140.029 190	.007 141
35	16.292 550	2293.882 485	.000 436	.061 378	140.793 338	.007 103
36	17.644 824	2496.723 526	.000 401	.056 674	141.498 923	.007 067
37	19.109 335	2716.400 273	.000 368	.052 330	142.150 433	.007 035
38	20.695 401	2954.310 082	.000 338	.048 320	142.752 013	.007 005
39	22.413 109	3211.966 288	.000 311	.044 617	143.307 488	.006 978
40	24.273 386	3491.007 831	.000 286	.041 197	143.820 392	.006 953
41	26.288 065	3793.209 686	.000 264	.038 040	144.293 988	.006 930
42	28.469 961	4120.494 145	.000 243	.035 125	144.731 289	.006 909
43	30.832 954	4474.943 053	.000 223	.032 433	145.135 075	.006 890
44	33.392 074	4858.811 045	.000 206	.029 947	145.507 916	.006 872
45	36.163 599	5274.539 891	.000 190	.027 652	145.852 183	.006 856
46	39.165 160	5724.774 027	.000 175	.025 533	146.170 065	.006 841
47	42.415 849	6212.377 374	.000 161	.023 576	146.463 586	.006 828
48	45.936 344	6740.451 558	.000 148	.021 769	146.734 612	.006 815
49	49.749 038	7312.355 639	.000 137	.020 101	146.984 866	.006 803
50	53.878 183	7931.727 477	.000 126	.018 560	147.215 942	.006 793
	$S^n = (1+i)^n$	$S_{\overline{n}} = \frac{S^n - 1}{i}$	$1/S_{\overline{n}} = \frac{i}{S^n - 1}$	$V^n = \frac{1}{S^n}$	$A_{\overline{n}} = \frac{1 - 1/S^n}{i}$	$\frac{1}{A_{\overline{n}}} = \frac{i}{1 - 1/S^n}$

8% QUARTERLY TABLE 8%

EFFECTIVE RATE 2% BASE 1.02

	1	2	3	4	5	6
QUARTERS	AMOUNT OF ONE	AMOUNT OF ONE PER PERIOD	SINKING FUND FACTOR	PRESENT WORTH OF ONE	PRESENT WORTH ONE PER PERIOD	PARTIAL PAYMENT
1	1.020 000	1.000 000	1.000 000	.980 392	.980 392	1.020 000
2	1.040 400	2.020 000	.495 050	.961 169	1.941 561	.515 050
3	1.061 208	3.060 400	.326 755	.942 322	2.883 883	.346 755
YEARS						
1	1.082 432	4.121 608	.242 624	.923 845	3.807 729	.262 624
2	1.171 659	8.582 969	.116 510	.853 490	7.325 481	.136 510
3	1.268 242	13.412 090	.074 560	.788 493	10.575 341	.094 560
4	1.372 786	18.639 285	.053 650	.728 446	13.577 709	.073 650
5	1.485 947	24.297 370	.041 157	.672 971	16.351 433	.061 157
6	1.608 437	30.421 862	.032 871	.621 721	18.913 926	.052 871
7	1.741 024	37.051 210	.026 990	.574 375	21.281 272	.046 990
8	1.884 541	44.227 030	.022 611	.530 633	23.468 335	.042 611
9	2.039 887	51.994 367	.019 233	.490 223	25.488 842	.039 233
10	2.208 040	60.401 983	.016 556	.452 890	27.355 479	.036 556
11	2.390 053	69.502 657	.014 388	.418 401	29.079 963	.034 388
12	2.587 070	79.353 519	.012 602	.386 538	30.673 120	.032 602
13	2.800 328	90.016 409	.011 109	.357 101	32.144 950	.031 109
14	3.031 165	101.558 264	.009 847	.329 906	33.504 694	.029 847
15	3.281 031	114.051 539	.008 768	.304 782	34.760 887	.028 768
16	3.551 493	127.574 662	.007 839	.281 572	35.921 415	.027 839
17	3.844 251	142.212 525	.007 032	.260 129	36.993 564	.027 032
18	4.161 140	158.057 019	.006 327	.240 319	37.984 063	.026 327
19	4.504 152	175.207 608	.005 708	.222 017	38.899 132	.025 708
20	4.875 439	193.771 958	.005 161	.205 110	39.744 514	.025 161
21	5.277 332	213.866 607	.004 676	.189 490	40.525 516	.024 676
22	5.712 354	235.617 701	.004 244	.175 059	41.247 041	.024 244
23	6.183 236	259.161 785	.003 859	.161 728	41.913 619	.023 859
24	6.692 933	284.646 659	.003 513	.149 411	42.529 434	.023 513
25	7.244 646	312.232 306	.003 203	.138 033	43.098 352	.023 203
26	7.841 838	342.091 897	.002 923	.127 521	43.623 944	.022 923
27	8.488 258	374.412 879	.002 671	.117 810	44.109 510	.022 671
28	9.187 963	409.398 150	.002 443	.108 838	44.558 097	.022 443
29	9.945 347	447.267 331	.002 236	.100 550	44.972 523	.022 236
30	10.765 163	488.258 152	.002 048	.092 892	45.355 389	.022 048
31	11.652 559	532.627 934	.001 877	.085 818	45.709 097	.021 877
32	12.613 104	580.655 213	.001 722	.079 283	46.035 869	.021 722
33	13.652 830	632.641 484	.001 581	.073 245	46.337 756	.021 581
34	14.778 262	688.913 096	.001 452	.067 667	46.616 652	.021 452
35	15.996 466	749.823 299	.001 334	.062 514	46.874 310	.021 334
36	17.315 089	815.754 461	.001 226	.057 753	47.112 345	.021 226
37	18.742 409	887.120 471	.001 127	.053 355	47.332 253	.021 127
38	20.287 387	964.369 336	.001 037	.049 292	47.535 414	.021 037
39	21.959 720	1047.985 991	.000 954	.045 538	47.723 104	.020 954
40	23.769 907	1138.495 348	.000 878	.042 070	47.896 500	.020 878
41	25.729 312	1236.465 587	.000 809	.038 866	48.056 691	.020 809
42	27.850 234	1342.511 724	.000 745	.035 906	48.204 683	.020 745
43	30.145 989	1457.299 473	.000 686	.033 172	48.341 405	.020 686
44	32.630 988	1581.549 425	.000 632	.030 646	48.467 714	.020 632
45	35.320 831	1716.041 568	.000 583	.028 312	48.584 405	.020 583
46	38.232 404	1861.620 189	.000 537	.026 156	48.692 209	.020 537
47	41.383 983	2019.199 170	.000 495	.024 164	48.791 803	.020 495
48	44.795 355	2189.767 727	.000 457	.022 324	48.883 813	.020 457
49	48.487 932	2374.396 619	.000 421	.020 624	48.968 816	.020 421
50	52.484 897	2574.244 869	.000 388	.019 053	49.047 345	.020 388
	$S^n = (1+i)^n$	$S_{\overline{n}|} = \frac{S^n - 1}{i}$	$1/S_{\overline{n}|} = \frac{i}{S^n - 1}$	$V^n = \frac{1}{S^n}$	$A_{\overline{n}|} = \frac{1 - 1/S^n}{i}$	$\frac{1}{A_{\overline{n}|}} = \frac{i}{1 - 1/S^n}$

SEMI-ANNUAL TABLE

EFFECTIVE RATE 4% BASE 1.04

HALF YEARS	1 AMOUNT OF ONE	2 AMOUNT OF ONE PER PERIOD	3 SINKING FUND FACTOR	4 PRESENT WORTH OF ONE	5 PRESENT WORTH ONE PER PERIOD	6 PARTIAL PAYMENT
1	1.040 000	1.000 000	1.000 000	.961 538	.961 538	1.040 000
YEARS						
1	1.081 600	2.040 000	.490 196	.924 556	1.886 095	.530 196
2	1.169 859	4.246 464	.235 490	.854 804	3.629 895	.275 490
3	1.265 319	6.632 975	.150 762	.790 315	5.242 137	.190 762
4	1.368 569	9.214 226	.108 528	.730 690	6.732 745	.148 528
5	1.480 244	12.006 107	.083 291	.675 564	8.110 896	.123 291
6	1.601 032	15.025 805	.066 552	.624 597	9.385 074	.106 552
7	1.731 676	18.291 911	.054 669	.577 475	10.563 123	.094 669
8	1.872 981	21.824 531	.045 820	.533 908	11.652 296	.085 820
9	2.025 817	25.645 413	.038 993	.493 628	12.659 297	.078 993
10	2.191 123	29.778 079	.033 582	.456 387	13.590 326	.073 582
11	2.369 919	34.247 970	.029 199	.421 955	14.451 115	.069 199
12	2.563 304	39.082 604	.025 587	.390 121	15.246 963	.065 587
13	2.772 470	44.311 745	.022 567	.360 689	15.982 769	.062 567
14	2.998 703	49.967 583	.020 013	.333 477	16.663 063	.060 013
15	3.243 398	56.084 938	.017 830	.308 319	17.292 033	.057 830
16	3.508 059	62.701 469	.015 949	.285 058	17.873 551	.055 949
17	3.794 316	69.857 909	.014 315	.263 552	18.411 198	.054 315
18	4.103 933	77.598 314	.012 887	.243 669	18.908 282	.052 887
19	4.438 813	85.970 336	.011 632	.225 285	19.367 864	.051 632
20	4.801 021	95.025 516	.010 523	.208 289	19.792 774	.050 523
21	5.192 784	104.819 598	.009 540	.192 575	20.185 627	.049 540
22	5.616 515	115.412 877	.008 665	.178 046	20.548 841	.048 665
23	6.074 823	126.870 568	.007 882	.164 614	20.884 654	.047 882
24	6.570 528	139.263 206	.007 181	.152 195	21.195 131	.047 181
25	7.106 683	152.667 084	.006 550	.140 713	21.482 185	.046 550
26	7.686 589	167.164 718	.005 982	.130 097	21.747 582	.045 982
27	8.313 814	182.845 359	.005 469	.120 282	21.992 957	.045 469
28	8.992 222	199.805 540	.005 005	.111 207	22.219 819	.045 005
29	9.725 987	218.149 672	.004 584	.102 817	22.429 567	.044 584
30	10.519 627	237.990 685	.004 202	.095 060	22.623 490	.044 202
31	11.378 029	259.450 725	.003 854	.087 889	22.802 783	.043 854
32	12.306 476	282.661 904	.003 538	.081 258	22.968 549	.043 538
33	13.310 685	307.767 116	.003 249	.075 128	23.121 810	.043 249
34	14.396 836	334.920 912	.002 986	.069 460	23.263 507	.042 986
35	15.571 618	364.290 459	.002 745	.064 219	23.394 515	.042 745
36	16.842 262	396.056 560	.002 525	.059 374	23.515 639	.042 525
37	18.216 591	430.414 776	.002 323	.054 895	23.627 625	.042 323
38	19.703 065	467.576 621	.002 139	.050 754	23.731 162	.042 139
39	21.310 835	507.770 873	.001 969	.046 924	23.826 888	.041 969
40	23.049 799	551.244 977	.001 814	.043 384	23.915 392	.041 814
41	24.930 663	598.266 567	.001 671	.040 111	23.997 219	.041 671
42	26.965 005	649.125 119	.001 541	.037 085	24.072 872	.041 541
43	29.165 349	704.133 728	.001 420	.034 287	24.142 818	.041 420
44	31.545 242	763.631 041	.001 310	.031 701	24.207 487	.041 310
45	34.119 333	827.983 334	.001 208	.029 309	24.267 278	.041 208
46	36.903 471	897.586 774	.001 114	.027 098	24.322 557	.041 114
47	39.914 794	972.869 854	.001 028	.025 053	24.373 666	.041 028
48	43.171 841	1054.296 034	.000 949	.023 163	24.420 919	.040 949
49	46.694 664	1142.366 591	.000 875	.021 416	24.464 607	.040 875
50	50.504 948	1237.623 705	.000 808	.019 800	24.504 999	.040 808
	$S^n = (1+i)^n$	$S_{\overline{n}|} = \frac{S^n - 1}{i}$	$1/S_{\overline{n}|} = \frac{i}{S^n - 1}$	$V^n = \frac{1}{S^n}$	$A_{\overline{n}|} = \frac{1 - 1/S^n}{i}$	$\frac{1}{A_{\overline{n}|}} = \frac{i}{1 - 1/S^n}$

	1	2	3	4	5	6
YEARS	AMOUNT OF ONE	AMOUNT OF ONE PER PERIOD	SINKING FUND FACTOR	PRESENT WORTH OF ONE	PRESENT WORTH ONE PER PERIOD	PARTIAL PAYMENT
1	1.082 500	1.000 000	1.000 000	.923 788	.923 788	1.082 500
2	1.171 806	2.082 500	.480 192	.853 383	1.777 171	.562 692
3	1.268 480	3.254 306	.307 285	.788 345	2.565 516	.389 785
4	1.373 130	4.522 787	.221 103	.728 263	3.293 779	.303 603
5	1.486 413	5.895 916	.169 609	.672 760	3.966 540	.252 109
6	1.609 042	7.382 330	.135 459	.621 488	4.588 027	.217 959
7	1.741 788	8.991 372	.111 218	.574 123	5.162 150	.193 718
8	1.885 486	10.733 160	.093 169	.530 367	5.692 517	.175 669
9	2.041 038	12.618 646	.079 248	.489 947	6.182 464	.161 748
10	2.209 424	14.659 684	.068 214	.452 607	6.635 071	.150 714
11	2.391 701	16.869 108	.059 280	.418 112	7.053 183	.141 780
12	2.589 017	19.260 809	.051 919	.386 247	7.439 430	.134 419
13	2.802 611	21.849 826	.045 767	.356 810	7.796 240	.128 267
14	3.033 826	24.652 436	.040 564	.329 617	8.125 857	.123 064
15	3.284 117	27.686 262	.036 119	.304 496	8.430 353	.118 619
16	3.555 056	30.970 379	.032 289	.281 289	8.711 642	.114 789
17	3.848 348	34.525 435	.028 964	.259 852	8.971 494	.111 464
18	4.165 837	38.373 784	.026 059	.240 048	9.211 542	.108 559
19	4.509 519	42.539 621	.023 507	.221 753	9.433 295	.106 007
20	4.881 554	47.049 140	.021 254	.204 853	9.638 148	.103 754
21	5.284 282	51.930 694	.019 256	.189 240	9.827 388	.101 756
22	5.720 236	57.214 976	.017 478	.174 818	10.002 206	.099 978
23	6.192 155	62.935 212	.015 889	.161 495	10.163 701	.098 389
24	6.703 008	69.127 366	.014 466	.149 187	10.312 888	.096 966
25	7.256 006	75.830 374	.013 187	.137 817	10.450 705	.095 687
26	7.854 626	83.086 380	.012 036	.127 314	10.578 018	.094 536
27	8.502 633	90.941 006	.010 996	.117 611	10.695 629	.093 496
28	9.204 100	99.443 639	.010 056	.108 647	10.804 276	.092 556
29	9.963 439	108.647 740	.009 204	.100 367	10.904 643	.091 704
30	10.785 422	118.611 178	.008 431	.092 718	10.997 361	.090 931
31	11.675 220	129.396 600	.007 728	.085 651	11.083 012	.090 228
32	12.638 425	141.071 820	.007 089	.079 124	11.162 136	.089 589
33	13.681 095	153.710 245	.006 506	.073 094	11.235 230	.089 006
34	14.809 786	167.391 340	.005 974	.067 523	11.302 752	.088 474
35	16.031 593	182.201 126	.005 488	.062 377	11.365 129	.087 988
36	17.354 199	198.232 719	.005 045	.057 623	11.422 752	.087 545
37	18.785 921	215.586 918	.004 639	.053 231	11.475 984	.087 139
38	20.335 759	234.372 839	.004 267	.049 174	11.525 158	.086 767
39	22.013 459	254.708 598	.003 926	.045 427	11.570 585	.086 426
40	23.829 570	276.722 058	.003 614	.041 965	11.612 549	.086 114
41	25.795 509	300.551 627	.003 327	.038 766	11.651 316	.085 827
42	27.923 639	326.347 137	.003 064	.035 812	11.687 128	.085 564
43	30.227 339	354.270 775	.002 823	.033 083	11.720 210	.085 323
44	32.721 094	384.498 114	.002 601	.030 561	11.750 772	.085 101
45	35.420 585	417.219 209	.002 397	.028 232	11.779 004	.084 897
46	38.342 783	452.639 793	.002 209	.026 081	11.805 085	.084 709
47	41.506 063	490.982 576	.002 037	.024 093	11.829 177	.084 537
48	44.930 313	532.488 639	.001 878	.022 257	11.851 434	.084 378
49	48.637 064	577.418 952	.001 732	.020 560	11.871 995	.084 232
50	52.649 621	626.056 015	.001 597	.018 993	11.890 988	.084 097
51	56.993 215	678.705 636	.001 473	.017 546	11.908 534	.083 973
52	61.695 155	735.698 851	.001 359	.016 209	11.924 743	.083 859
53	66.785 006	797.394 007	.001 254	.014 973	11.939 716	.083 754
54	72.294 768	864.179 012	.001 157	.013 832	11.953 548	.083 657
55	78.259 087	936.473 781	.001 068	.012 778	11.966 326	.083 568
56	84.715 462	1014.732 868	.000 985	.011 804	11.978 131	.083 485
57	91.704 487	1099.448 329	.000 910	.010 905	11.989 035	.083 410
58	99.270 107	1191.152 816	.000 840	.010 074	11.999 109	.083 340
59	107.459 891	1290.422 924	.000 775	.009 306	12.008 415	.083 275
60	116.325 332	1397.882 815	.000 715	.008 597	12.017 011	.083 215
	$S^n = (1+i)^n$	$S_{\overline{n}|} = \frac{S^n - 1}{i}$	$1/S_{\overline{n}|} = \frac{i}{S^n - 1}$	$V^n = \frac{1}{S^n}$	$A_{\overline{n}|} = \frac{1 - 1/S^n}{i}$	$\frac{1}{A_{\overline{n}|}} = \frac{i}{1 - 1/S^n}$

YEARS	1 AMOUNT OF ONE	2 AMOUNT OF ONE PER PERIOD	3 SINKING FUND FACTOR	4 PRESENT WORTH OF ONE	5 PRESENT WORTH ONE PER PERIOD	6 PARTIAL PAYMENT
1	1.085 000	1.000 000	1.000 000	.921 659	.921 659	1.085 000
2	1.177 225	2.085 000	.479 616	.849 455	1.771 114	.564 616
3	1.277 289	3.262 225	.306 539	.782 908	2.554 022	.391 539
4	1.385 859	4.539 514	.220 288	.721 574	3.275 597	.305 288
5	1.503 657	5.925 373	.168 766	.665 045	3.940 642	.253 766
6	1.631 468	7.429 030	.134 607	.612 945	4.553 587	.219 607
7	1.770 142	9.060 497	.110 369	.564 926	5.118 514	.195 369
8	1.920 604	10.830 639	.092 331	.520 669	5.639 183	.177 331
9	2.083 856	12.751 244	.078 424	.479 880	6.119 063	.163 424
10	2.260 983	14.835 099	.067 408	.442 285	6.561 348	.152 408
11	2.453 167	17.096 083	.058 493	.407 636	6.968 984	.143 493
12	2.661 686	19.549 250	.051 153	.375 702	7.344 686	.136 153
13	2.887 930	22.210 936	.045 023	.346 269	7.690 955	.130 023
14	3.133 404	25.098 866	.039 842	.319 142	8.010 097	.124 842
15	3.399 743	28.232 269	.035 420	.294 140	8.304 237	.120 420
16	3.688 721	31.632 012	.031 614	.271 097	8.575 333	.116 614
17	4.002 262	35.320 733	.028 312	.249 859	8.825 192	.113 312
18	4.342 455	39.322 995	.025 430	.230 285	9.055 476	.110 430
19	4.711 563	43.665 450	.022 901	.212 244	9.267 720	.107 901
20	5.112 046	48.377 013	.020 671	.195 616	9.463 337	.105 671
21	5.546 570	53.489 059	.018 695	.180 292	9.643 628	.103 695
22	6.018 028	59.035 629	.016 939	.166 167	9.809 796	.101 939
23	6.529 561	65.053 658	.015 372	.153 150	9.962 945	.100 372
24	7.084 574	71.583 219	.013 970	.141 152	10.104 097	.098 970
25	7.686 762	78.667 792	.012 712	.130 094	10.234 191	.097 712
26	8.340 137	86.354 555	.011 580	.119 902	10.354 093	.096 580
27	9.049 049	94.694 692	.010 560	.110 509	10.464 602	.095 560
28	9.818 218	103.743 741	.009 639	.101 851	10.566 453	.094 639
29	10.652 766	113.561 959	.008 806	.093 872	10.660 326	.093 806
30	11.558 252	124.214 725	.008 051	.086 518	10.746 844	.093 051
31	12.540 703	135.772 977	.007 365	.079 740	10.826 584	.092 365
32	13.606 663	148.313 680	.006 742	.073 493	10.900 078	.091 742
33	14.763 229	161.920 343	.006 176	.067 736	10.967 813	.091 176
34	16.018 104	176.683 572	.005 660	.062 429	11.030 243	.090 660
35	17.379 642	192.701 675	.005 189	.057 539	11.087 781	.090 189
36	18.856 912	210.081 318	.004 760	.053 031	11.140 812	.089 760
37	20.459 750	228.938 230	.004 368	.048 876	11.189 689	.089 368
38	22.198 828	249.397 979	.004 010	.045 047	11.234 736	.089 010
39	24.085 729	271.596 808	.003 682	.041 518	11.276 255	.088 682
40	26.133 016	295.682 536	.003 382	.038 266	11.314 520	.088 382
41	28.354 322	321.815 552	.003 107	.035 268	11.349 788	.088 107
42	30.764 439	350.169 874	.002 856	.032 505	11.382 293	.087 856
43	33.379 417	380.934 313	.002 625	.029 959	11.412 252	.087 625
44	36.216 667	414.313 730	.002 414	.027 612	11.439 864	.087 414
45	39.295 084	450.530 397	.002 220	.025 448	11.465 312	.087 220
46	42.635 166	489.825 480	.002 042	.023 455	11.488 767	.087 042
47	46.259 155	532.460 646	.001 878	.021 617	11.510 384	.086 878
48	50.191 183	578.719 801	.001 728	.019 924	11.530 308	.086 728
49	54.457 434	628.910 984	.001 590	.018 363	11.548 671	.086 590
50	59.086 316	683.368 418	.001 463	.016 924	11.565 595	.086 463
51	64.108 652	742.454 733	.001 347	.015 599	11.581 194	.086 347
52	69.557 888	806.563 386	.001 240	.014 377	11.595 570	.086 240
53	75.470 308	876.121 273	.001 141	.013 250	11.608 821	.086 141
54	81.885 284	951.591 582	.001 051	.012 212	11.621 033	.086 051
55	88.845 534	1033.476 866	.000 968	.011 255	11.632 288	.085 968
56	96.397 404	1122.322 400	.000 891	.010 374	11.642 662	.085 891
57	104.591 183	1218.719 804	.000 821	.009 561	11.652 223	.085 821
58	113.481 434	1323.310 987	.000 756	.008 812	11.661 035	.085 756
59	123.127 356	1436.792 421	.000 696	.008 122	11.669 157	.085 696
60	133.593 181	1559.919 777	.000 641	.007 485	11.676 642	.085 641
	$S^n = (1+i)^n$	$S_{\overline{n}|} = \frac{S^n - 1}{i}$	$1/S_{\overline{n}|} = \frac{i}{S^n - 1}$	$V^n = \frac{1}{S^n}$	$A_{\overline{n}|} = \frac{1 - 1/S^n}{i}$	$\frac{1}{A_{\overline{n}|}} = \frac{i}{1 - 1/S^n}$

YEARS	1 AMOUNT OF ONE	2 AMOUNT OF ONE PER PERIOD	3 SINKING FUND FACTOR	4 PRESENT WORTH OF ONE	5 PRESENT WORTH ONE PER PERIOD	6 PARTIAL PAYMENT
1	1.087 500	1.000 000	1.000 000	.919 540	.919 540	1.087 500
2	1.182 656	2.087 500	.479 042	.845 554	1.765 094	.566 542
3	1.286 139	3.270 156	.305 796	.777 521	2.542 616	.393 296
4	1.398 676	4.556 295	.219 477	.714 962	3.257 578	.306 977
5	1.521 060	5.954 971	.167 927	.657 436	3.915 014	.255 427
6	1.654 153	7.476 031	.133 761	.604 539	4.519 553	.221 261
7	1.798 891	9.130 183	.109 527	.555 898	5.075 451	.197 027
8	1.956 294	10.929 074	.091 499	.511 171	5.586 622	.178 999
9	2.127 470	12.885 368	.077 607	.470 042	6.056 664	.165 107
10	2.313 623	15.012 838	.066 610	.432 222	6.488 886	.154 110
11	2.516 065	17.326 461	.057 715	.397 446	6.886 332	.145 215
12	2.736 221	19.842 527	.050 397	.365 468	7.251 800	.137 897
13	2.975 640	22.578 748	.044 289	.336 062	7.587 862	.131 789
14	3.236 009	25.554 388	.039 132	.309 023	7.896 884	.126 632
15	3.519 160	28.790 397	.034 734	.284 159	8.181 043	.122 234
16	3.827 086	32.309 557	.030 951	.261 295	8.442 338	.118 451
17	4.161 956	36.136 643	.027 673	.240 272	8.682 610	.115 173
18	4.526 127	40.298 600	.024 815	.220 939	8.903 549	.112 315
19	4.922 164	44.824 727	.022 309	.203 163	9.106 712	.109 809
20	5.352 853	49.746 891	.020 102	.186 816	9.293 528	.107 602
21	5.821 228	55.099 744	.018 149	.171 785	9.465 313	.105 649
22	6.330 585	60.920 971	.016 415	.157 963	9.623 277	.103 915
23	6.884 511	67.251 556	.014 870	.145 254	9.768 530	.102 370
24	7.486 906	74.136 067	.013 489	.133 567	9.902 097	.100 989
25	8.142 010	81.622 973	.012 251	.122 820	10.024 917	.099 751
26	8.854 436	89.764 984	.011 140	.112 938	10.137 854	.098 640
27	9.629 199	98.619 420	.010 140	.103 851	10.241 705	.097 640
28	10.471 754	108.248 619	.009 238	.095 495	10.337 200	.096 738
29	11.388 033	118.720 373	.008 423	.087 811	10.425 012	.095 923
30	12.384 485	130.108 406	.007 686	.080 746	10.505 758	.095 186
31	13.468 128	142.492 891	.007 018	.074 249	10.580 007	.094 518
32	14.646 589	155.961 019	.006 412	.068 275	10.648 282	.093 912
33	15.928 166	170.607 608	.005 861	.062 782	10.711 064	.093 361
34	17.321 880	186.535 774	.005 361	.057 730	10.768 795	.092 861
35	18.837 545	203.857 654	.004 905	.053 085	10.821 880	.092 405
36	20.485 830	222.695 199	.004 490	.048 814	10.870 695	.091 990
37	22.278 340	243.181 029	.004 112	.044 887	10.915 581	.091 612
38	24.227 695	265.459 369	.003 767	.041 275	10.956 856	.091 267
39	26.347 618	289.687 064	.003 452	.037 954	10.994 810	.090 952
40	28.653 035	316.034 682	.003 164	.034 900	11.029 711	.090 664
41	31.160 175	344.687 716	.002 901	.032 092	11.061 803	.090 401
42	33.886 691	375.847 892	.002 661	.029 510	11.091 313	.090 161
43	36.851 776	409.734 582	.002 441	.027 136	11.118 449	.089 941
44	40.076 306	446.586 358	.002 239	.024 952	11.143 401	.089 739
45	43.582 983	486.662 664	.002 055	.022 945	11.166 346	.089 555
46	47.396 494	530.245 648	.001 886	.021 099	11.187 444	.089 386
47	51.543 687	577.642 142	.001 731	.019 401	11.206 846	.089 231
48	56.053 760	629.185 829	.001 589	.017 840	11.224 686	.089 089
49	60.958 464	685.239 589	.001 459	.016 405	11.241 090	.088 959
50	66.292 330	746.198 053	.001 340	.015 085	11.256 175	.088 840
51	72.092 909	812.490 383	.001 231	.013 871	11.270 046	.088 731
52	78.401 038	884.583 291	.001 130	.012 755	11.282 801	.088 630
53	85.261 129	962.984 329	.001 038	.011 729	11.294 529	.088 538
54	92.721 478	1048.245 458	.000 954	.010 785	11.305 314	.088 454
55	100.834 607	1140.966 936	.000 876	.009 917	11.315 232	.088 376
56	109.657 635	1241.801 543	.000 805	.009 119	11.324 351	.088 305
57	119.252 678	1351.459 178	.000 740	.008 386	11.332 737	.088 240
58	129.687 287	1470.711 856	.000 680	.007 711	11.340 447	.088 180
59	141.034 925	1600.399 143	.000 625	.007 090	11.347 538	.088 125
60	153.375 481	1741.434 068	.000 574	.006 520	11.354 058	.088 074
	$S^n = (1+i)^n$	$S_{\overline{n}} = \frac{S^n - 1}{i}$	$1/S_{\overline{n}} = \frac{i}{S^n - 1}$	$V^n = \frac{1}{S^n}$	$A_{\overline{n}} = \frac{1 - 1/S^n}{i}$	$\frac{1}{A_{\overline{n}}} = \frac{i}{1 - 1/S^n}$

YEARS	1 AMOUNT OF ONE	2 AMOUNT OF ONE PER PERIOD	3 SINKING FUND FACTOR	4 PRESENT WORTH OF ONE	5 PRESENT WORTH ONE PER PERIOD	6 PARTIAL PAYMENT
1	1.090 000	1.000 000	1.000 000	.917 431	.917 431	1.090 000
2	1.188 100	2.090 000	.478 469	.841 680	1.759 111	.568 469
3	1.295 029	3.278 100	.305 055	.772 183	2.531 295	.395 055
4	1.411 582	4.573 129	.218 669	.708 425	3.239 720	.308 669
5	1.538 624	5.984 711	.167 092	.649 931	3.889 651	.257 092
6	1.677 100	7.523 335	.132 920	.596 267	4.485 919	.222 920
7	1.828 039	9.200 435	.108 691	.547 034	5.032 953	.198 691
8	1.992 563	11.028 474	.090 674	.501 866	5.534 819	.180 674
9	2.171 893	13.021 036	.076 799	.460 428	5.995 247	.166 799
10	2.367 364	15.192 930	.065 820	.422 411	6.417 658	.155 820
11	2.580 426	17.560 293	.056 947	.387 533	6.805 191	.146 947
12	2.812 665	20.140 720	.049 651	.355 535	7.160 725	.139 651
13	3.065 805	22.953 385	.043 567	.326 179	7.486 904	.133 567
14	3.341 727	26.019 189	.038 433	.299 246	7.786 150	.128 433
15	3.642 482	29.360 916	.034 059	.274 538	8.060 688	.124 059
16	3.970 306	33.003 399	.030 300	.251 870	8.312 558	.120 300
17	4.327 633	36.973 705	.027 046	.231 073	8.543 631	.117 046
18	4.717 120	41.301 338	.024 212	.211 994	8.755 625	.114 212
19	5.141 661	46.018 458	.021 730	.194 490	8.950 115	.111 730
20	5.604 411	51.160 120	.019 546	.178 431	9.128 546	.109 546
21	6.108 808	56.764 530	.017 617	.163 698	9.292 244	.107 617
22	6.658 600	62.873 338	.015 905	.150 182	9.442 425	.105 905
23	7.257 874	69.531 939	.014 382	.137 781	9.580 207	.104 382
24	7.911 083	76.789 813	.013 023	.126 405	9.706 612	.103 023
25	8.623 081	84.700 896	.011 806	.115 968	9.822 580	.101 806
26	9.399 158	93.323 977	.010 715	.106 393	9.928 972	.100 715
27	10.245 082	102.723 135	.009 735	.097 608	10.026 580	.099 735
28	11.167 140	112.968 217	.008 852	.089 548	10.116 128	.098 852
29	12.172 182	124.135 356	.008 056	.082 155	10.198 283	.098 056
30	13.267 678	136.307 539	.007 336	.075 371	10.273 654	.097 336
31	14.461 770	149.575 217	.006 686	.069 148	10.342 802	.096 686
32	15.763 329	164.036 987	.006 096	.063 438	10.406 240	.096 096
33	17.182 028	179.800 315	.005 562	.058 200	10.464 441	.095 562
34	18.728 411	196.982 344	.005 077	.053 395	10.517 835	.095 077
35	20.413 968	215.710 755	.004 636	.048 986	10.566 821	.094 636
36	22.251 225	236.124 723	.004 235	.044 941	10.611 763	.094 235
37	24.253 835	258.375 948	.003 870	.041 231	10.652 993	.093 870
38	26.436 680	282.629 783	.003 538	.037 826	10.690 820	.093 538
39	28.815 982	309.066 463	.003 236	.034 703	10.725 523	.093 236
40	31.409 420	337.882 445	.002 960	.031 838	10.757 360	.092 960
41	34.236 268	369.291 865	.002 708	.029 209	10.786 569	.092 708
42	37.317 532	403.528 133	.002 478	.026 797	10.813 366	.092 478
43	40.676 110	440.845 665	.002 268	.024 584	10.837 950	.092 268
44	44.336 960	481.521 775	.002 077	.022 555	10.860 505	.092 077
45	48.327 286	525.858 734	.001 902	.020 692	10.881 197	.091 902
46	52.676 742	574.186 021	.001 742	.018 984	10.900 181	.091 742
47	57.417 649	626.862 762	.001 595	.017 416	10.917 597	.091 595
48	62.585 237	684.280 411	.001 461	.015 978	10.933 575	.091 461
49	68.217 908	746.865 648	.001 339	.014 659	10.948 234	.091 339
50	74.357 520	815.083 556	.001 227	.013 449	10.961 683	.091 227
51	81.049 697	889.441 076	.001 124	.012 338	10.974 021	.091 124
52	88.344 170	970.490 773	.001 030	.011 319	10.985 340	.091 030
53	96.295 145	1058.834 943	.000 944	.010 385	10.995 725	.090 944
54	104.961 708	1155.130 088	.000 866	.009 527	11.005 252	.090 866
55	114.408 262	1260.091 796	.000 794	.008 741	11.013 993	.090 794
56	124.705 005	1374.500 057	.000 728	.008 019	11.022 012	.090 728
57	135.928 456	1499.205 063	.000 667	.007 357	11.029 369	.090 667
58	148.162 017	1635.133 518	.000 612	.006 749	11.036 118	.090 612
59	161.496 598	1783.295 535	.000 561	.006 192	11.042 310	.090 561
60	176.031 292	1944.792 133	.000 514	.005 681	11.047 991	.090 514
	$S^n = (1+i)^n$	$S_{\overline{n}|} = \frac{S^n - 1}{i}$	$1/S_{\overline{n}|} = \frac{i}{S^n - 1}$	$V^n = \frac{1}{S^n}$	$A_{\overline{n}|} = \frac{1 - 1/S^n}{i}$	$\frac{1}{A_{\overline{n}|}} = \frac{i}{1 - 1/S^n}$

YEARS	1 AMOUNT OF ONE	2 AMOUNT OF ONE PER PERIOD	3 SINKING FUND FACTOR	4 PRESENT WORTH OF ONE	5 PRESENT WORTH ONE PER PERIOD	6 PARTIAL PAYMENT
1	1.092 500	1.000 000	1.000 000	.915 332	.915 332	1.092 500
2	1.193 556	2.092 500	.477 897	.837 832	1.753 164	.570 397
3	1.303 960	3.286 056	.304 316	.766 895	2.520 059	.396 816
4	1.424 577	4.590 016	.217 864	.701 963	3.222 022	.310 364
5	1.556 350	6.014 593	.166 262	.642 529	3.864 551	.258 762
6	1.700 312	7.570 943	.132 084	.588 127	4.452 678	.224 584
7	1.857 591	9.271 255	.107 860	.538 332	4.991 010	.200 360
8	2.029 418	11.128 846	.089 857	.492 752	5.483 762	.182 357
9	2.217 139	13.158 264	.075 998	.451 032	5.934 793	.168 498
10	2.422 225	15.375 404	.065 039	.412 844	6.347 637	.157 539
11	2.646 281	17.797 629	.056 187	.377 889	6.725 526	.148 687
12	2.891 062	20.443 909	.048 914	.345 894	7.071 419	.141 414
13	3.158 485	23.334 971	.042 854	.316 608	7.388 027	.135 354
14	3.450 645	26.493 456	.037 745	.289 801	7.677 828	.130 245
15	3.769 829	29.944 100	.033 396	.265 264	7.943 092	.125 896
16	4.118 539	33.713 930	.029 661	.242 805	8.185 896	.122 161
17	4.499 503	37.832 468	.026 432	.222 247	8.408 143	.118 932
18	4.915 707	42.331 972	.023 623	.203 430	8.611 573	.116 123
19	5.370 410	47.247 679	.021 165	.186 206	8.797 778	.113 665
20	5.867 173	52.618 089	.019 005	.170 440	8.968 218	.111 505
21	6.409 887	58.485 262	.017 098	.156 009	9.124 227	.109 598
22	7.002 801	64.895 149	.015 409	.142 800	9.267 027	.107 909
23	7.650 560	71.897 951	.013 909	.130 709	9.397 736	.106 409
24	8.358 237	79.548 511	.012 571	.119 642	9.517 379	.105 071
25	9.131 374	87.906 748	.011 376	.109 513	9.626 891	.103 876
26	9.976 026	97.038 122	.010 305	.100 240	9.727 132	.102 805
27	10.898 809	107.014 149	.009 345	.091 753	9.818 885	.101 845
28	11.906 949	117.912 958	.008 481	.083 985	9.902 869	.100 981
29	13.008 341	129.819 906	.007 703	.076 874	9.979 743	.100 203
30	14.211 613	142.828 247	.007 001	.070 365	10.050 108	.099 501
31	15.526 187	157.039 860	.006 368	.064 407	10.114 516	.098 868
32	16.962 359	172.566 047	.005 795	.058 954	10.173 470	.098 295
33	18.531 378	189.528 407	.005 276	.053 963	10.227 432	.097 776
34	20.245 530	208.059 784	.004 806	.049 394	10.276 826	.097 306
35	22.118 242	228.305 315	.004 380	.045 212	10.322 037	.096 880
36	24.164 179	250.423 556	.003 993	.041 384	10.363 421	.096 493
37	26.399 365	274.587 735	.003 642	.037 880	10.401 301	.096 142
38	28.841 307	300.987 101	.003 322	.034 672	10.435 973	.095 822
39	31.509 128	329.828 407	.003 032	.031 737	10.467 710	.095 532
40	34.423 722	361.337 535	.002 767	.029 050	10.496 760	.095 267
41	37.607 916	395.761 257	.002 527	.026 590	10.523 350	.095 027
42	41.086 649	433.369 173	.002 308	.024 339	10.547 689	.094 808
43	44.887 164	474.455 822	.002 108	.022 278	10.569 967	.094 608
44	49.039 226	519.342 985	.001 926	.020 392	10.590 358	.094 426
45	53.575 355	568.382 212	.001 759	.018 665	10.609 024	.094 259
46	58.531 075	621.957 566	.001 608	.017 085	10.626 109	.094 108
47	63.945 199	680.488 641	.001 470	.015 638	10.641 747	.093 970
48	69.860 130	744.433 840	.001 343	.014 314	10.656 061	.093 843
49	76.322 192	814.293 970	.001 228	.013 102	10.669 164	.093 728
50	83.381 995	890.616 163	.001 123	.011 993	10.681 157	.093 623
51	91.094 830	973.998 158	.001 027	.010 978	10.692 134	.093 527
52	99.521 101	1065.092 987	.000 939	.010 048	10.702 182	.093 439
53	108.726 803	1164.614 089	.000 859	.009 197	10.711 380	.093 359
54	118.784 033	1273.340 892	.000 785	.008 419	10.719 798	.093 285
55	129.771 556	1392.124 924	.000 718	.007 706	10.727 504	.093 218
56	141.775 424	1521.896 480	.000 657	.007 053	10.734 558	.093 157
57	154.889 651	1663.671 904	.000 601	.006 456	10.741 014	.093 101
58	169.216 944	1818.561 555	.000 550	.005 910	10.746 924	.093 050
59	184.869 511	1987.778 499	.000 503	.005 409	10.752 333	.093 003
60	201.969 941	2172.648 011	.000 460	.004 951	10.757 284	.092 960
	$S^n = (1+i)^n$	$S_{\overline{n}} = \frac{S^n - 1}{i}$	$1/S_{\overline{n}} = \frac{i}{S^n - 1}$	$V^n = \frac{1}{S^n}$	$A_{\overline{n}} = \frac{1 - 1/S^n}{i}$	$\frac{1}{A_{\overline{n}}} = \frac{i}{1 - 1/S^n}$

YEARS	1 AMOUNT OF ONE	2 AMOUNT OF ONE PER PERIOD	3 SINKING FUND FACTOR	4 PRESENT WORTH OF ONE	5 PRESENT WORTH ONE PER PERIOD	6 PARTIAL PAYMENT
1	1.095 000	1.000 000	1.000 000	.913 242	.913 242	1.095 000
2	1.199 025	2.095 000	.477 327	.834 011	1.747 253	.572 327
3	1.312 932	3.294 025	.303 580	.761 654	2.508 907	.398 580
4	1.437 661	4.606 957	.217 063	.695 574	3.204 481	.312 063
5	1.574 239	6.044 618	.165 436	.635 228	3.839 709	.260 436
6	1.723 791	7.618 857	.131 253	.580 117	4.419 825	.226 253
7	1.887 552	9.342 648	.107 036	.529 787	4.949 612	.202 036
8	2.066 869	11.230 200	.089 046	.483 824	5.433 436	.184 046
9	2.263 222	13.297 069	.075 205	.441 848	5.875 284	.170 205
10	2.478 228	15.560 291	.064 266	.403 514	6.278 798	.159 266
11	2.713 659	18.038 518	.055 437	.368 506	6.647 304	.150 437
12	2.971 457	20.752 178	.048 188	.336 535	6.983 839	.143 188
13	3.253 745	23.723 634	.042 152	.307 338	7.291 178	.137 152
14	3.562 851	26.977 380	.037 068	.280 674	7.571 852	.132 068
15	3.901 322	30.540 231	.032 744	.256 323	7.828 175	.127 744
16	4.271 948	34.441 553	.029 035	.234 085	8.062 260	.124 035
17	4.677 783	38.713 500	.025 831	.213 777	8.276 037	.120 831
18	5.122 172	43.391 283	.023 046	.195 230	8.471 266	.118 046
19	5.608 778	48.513 454	.020 613	.178 292	8.649 558	.115 613
20	6.141 612	54.122 233	.018 477	.162 824	8.812 382	.113 477
21	6.725 065	60.263 845	.016 594	.148 697	8.961 080	.111 594
22	7.363 946	66.988 910	.014 928	.135 797	9.096 876	.109 928
23	8.063 521	74.352 856	.013 449	.124 015	9.220 892	.108 449
24	8.829 556	82.416 378	.012 134	.113 256	9.334 148	.107 134
25	9.668 364	91.245 934	.010 959	.103 430	9.437 578	.105 959
26	10.586 858	100.914 297	.009 909	.094 457	9.532 034	.104 909
27	11.592 610	111.501 156	.008 969	.086 262	9.618 296	.103 969
28	12.693 908	123.093 766	.008 124	.078 778	9.697 074	.103 124
29	13.899 829	135.787 673	.007 364	.071 943	9.769 018	.102 364
30	15.220 313	149.687 502	.006 681	.065 702	9.834 719	.101 681
31	16.666 242	164.907 815	.006 064	.060 002	9.894 721	.101 064
32	18.249 535	181.574 057	.005 507	.054 796	9.949 517	.100 507
33	19.983 241	199.823 593	.005 004	.050 042	9.999 559	.100 004
34	21.881 649	219.806 834	.004 549	.045 700	10.045 259	.099 549
35	23.960 406	241.688 483	.004 138	.041 736	10.086 995	.099 138
36	26.236 644	265.648 889	.003 764	.038 115	10.125 109	.098 764
37	28.729 126	291.885 534	.003 426	.034 808	10.159 917	.098 426
38	31.458 393	320.614 659	.003 119	.031 788	10.191 705	.098 119
39	34.446 940	352.073 052	.002 840	.029 030	10.220 735	.097 840
40	37.719 399	386.519 992	.002 587	.026 512	10.247 247	.097 587
41	41.302 742	424.239 391	.002 357	.024 211	10.271 458	.097 357
42	45.226 503	465.542 133	.002 148	.022 111	10.293 569	.097 148
43	49.523 020	510.768 636	.001 958	.020 193	10.313 762	.096 958
44	54.227 707	560.291 656	.001 785	.018 441	10.332 203	.096 785
45	59.379 340	614.519 364	.001 627	.016 841	10.349 043	.096 627
46	65.020 377	673.898 703	.001 484	.015 380	10.364 423	.096 484
47	71.197 313	738.919 080	.001 353	.014 045	10.378 469	.096 353
48	77.961 057	810.116 393	.001 234	.012 827	10.391 296	.096 234
49	85.367 358	888.077 450	.001 126	.011 714	10.403 010	.096 126
50	93.477 257	973.444 808	.001 027	.010 698	10.413 707	.096 027
51	102.357 596	1066.922 065	.000 937	.009 770	10.423 477	.095 937
52	112.081 568	1169.279 661	.000 855	.008 922	10.432 399	.095 855
53	122.729 317	1281.361 229	.000 780	.008 148	10.440 547	.095 780
54	134.388 602	1404.090 545	.000 712	.007 441	10.447 988	.095 712
55	147.155 519	1538.479 147	.000 650	.006 796	10.454 784	.095 650
56	161.135 293	1685.634 666	.000 593	.006 206	10.460 990	.095 593
57	176.443 146	1846.769 959	.000 541	.005 668	10.466 657	.095 541
58	193.205 245	2023.213 106	.000 494	.005 176	10.471 833	.095 494
59	211.559 743	2216.418 351	.000 451	.004 727	10.476 560	.095 451
60	231.657 919	2427.978 094	.000 412	.004 317	10.480 877	.095 412
	$S^n = (1+i)^n$	$S_{\overline{n}|} = \frac{S^n - 1}{i}$	$1/S_{\overline{n}|} = \frac{i}{S^n - 1}$	$V^n = \frac{1}{S^n}$	$A_{\overline{n}|} = \frac{1 - 1/S^n}{i}$	$\frac{1}{A_{\overline{n}|}} = \frac{i}{1 - 1/S^n}$

YEARS	1 AMOUNT OF ONE	2 AMOUNT OF ONE PER PERIOD	3 SINKING FUND FACTOR	4 PRESENT WORTH OF ONE	5 PRESENT WORTH ONE PER PERIOD	6 PARTIAL PAYMENT
1	1.097 500	1.000 000	1.000 000	.911 162	.911 162	1.097 500
2	1.204 506	2.097 500	.476 758	.830 216	1.741 377	.574 258
3	1.321 946	3.302 006	.302 846	.756 461	2.497 838	.400 346
4	1.450 835	4.623 952	.216 265	.689 258	3.187 096	.313 765
5	1.592 292	6.074 787	.164 615	.628 026	3.815 122	.262 115
6	1.747 540	7.667 079	.130 428	.572 233	4.387 355	.227 928
7	1.917 925	9.414 619	.106 218	.521 397	4.908 752	.203 718
8	2.104 923	11.332 544	.088 241	.475 077	5.383 828	.185 741
9	2.310 153	13.437 468	.074 419	.432 872	5.816 700	.171 919
10	2.535 393	15.747 621	.063 502	.394 416	6.211 116	.161 002
11	2.782 594	18.283 014	.054 696	.359 377	6.570 493	.152 196
12	3.053 897	21.065 607	.047 471	.327 450	6.897 944	.144 971
13	3.351 652	24.119 504	.041 460	.298 360	7.196 304	.138 960
14	3.678 438	27.471 156	.036 402	.271 855	7.468 159	.133 902
15	4.037 085	31.149 594	.032 103	.247 703	7.715 862	.129 603
16	4.430 701	35.186 679	.028 420	.225 698	7.941 560	.125 920
17	4.862 695	39.617 380	.025 241	.205 647	8.147 207	.122 741
18	5.336 807	44.480 075	.022 482	.187 378	8.334 585	.119 982
19	5.857 146	49.816 882	.020 074	.170 732	8.505 317	.117 574
20	6.428 218	55.674 028	.017 962	.155 564	8.660 881	.115 462
21	7.054 969	62.102 246	.016 102	.141 744	8.802 625	.113 602
22	7.742 828	69.157 215	.014 460	.129 152	8.931 777	.111 960
23	8.497 754	76.900 043	.013 004	.117 678	9.049 455	.110 504
24	9.326 285	85.397 797	.011 710	.107 224	9.156 679	.109 210
25	10.235 598	94.724 083	.010 557	.097 698	9.254 377	.108 057
26	11.233 569	104.959 681	.009 527	.089 019	9.343 396	.107 027
27	12.328 842	116.193 249	.008 606	.081 111	9.424 506	.106 106
28	13.530 904	128.522 091	.007 781	.073 905	9.498 411	.105 281
29	14.850 167	142.052 995	.007 040	.067 339	9.565 751	.104 540
30	16.298 058	156.903 162	.006 373	.061 357	9.627 108	.103 873
31	17.887 119	173.201 221	.005 774	.055 906	9.683 014	.103 274
32	19.631 113	191.088 340	.005 233	.050 940	9.733 953	.102 733
33	21.545 147	210.719 453	.004 746	.046 414	9.780 368	.102 246
34	23.645 798	232.264 599	.004 305	.042 291	9.822 658	.101 805
35	25.951 264	255.910 398	.003 908	.038 534	9.861 192	.101 408
36	28.481 512	281.861 661	.003 548	.035 110	9.896 303	.101 048
37	31.258 459	310.343 173	.003 222	.031 991	9.928 294	.100 722
38	34.306 159	341.601 633	.002 927	.029 149	9.957 443	.100 427
39	37.651 010	375.907 792	.002 660	.026 560	9.984 003	.100 160
40	41.321 983	413.558 802	.002 418	.024 200	10.008 203	.099 918
41	45.350 877	454.880 785	.002 198	.022 050	10.030 253	.099 698
42	49.772 587	500.231 662	.001 999	.020 091	10.050 345	.099 499
43	54.625 414	550.004 249	.001 818	.018 306	10.068 651	.099 318
44	59.951 392	604.629 663	.001 654	.016 680	10.085 331	.099 154
45	65.796 653	664.581 055	.001 505	.015 198	10.100 530	.099 005
46	72.211 827	730.377 708	.001 369	.013 848	10.114 378	.098 869
47	79.252 480	802.589 534	.001 246	.012 618	10.126 996	.098 746
48	86.979 596	881.842 014	.001 134	.011 497	10.138 493	.098 634
49	95.460 107	968.821 610	.001 032	.010 476	10.148 968	.098 532
50	104.767 467	1064.281 717	.000 940	.009 545	10.158 513	.098 440
51	114.982 295	1169.049 185	.000 855	.008 697	10.167 210	.098 355
52	126.193 069	1284.031 480	.000 779	.007 924	10.175 135	.098 279
53	138.496 894	1410.224 549	.000 709	.007 220	10.182 355	.098 209
54	152.000 341	1548.721 443	.000 646	.006 579	10.188 934	.098 146
55	166.820 374	1700.721 784	.000 588	.005 994	10.194 928	.098 088
56	183.085 360	1867.542 158	.000 535	.005 462	10.200 390	.098 035
57	200.936 183	2050.627 518	.000 488	.004 977	10.205 367	.097 988
58	220.527 461	2251.563 701	.000 444	.004 535	10.209 902	.097 944
59	242.028 888	2472.091 162	.000 405	.004 132	10.214 033	.097 905
60	265.626 705	2714.120 050	.000 368	.003 765	10.217 798	.097 868
	$S^n = (1+i)^n$	$S_{\overline{n}|} = \frac{S^n - 1}{i}$	$1/S_{\overline{n}|} = \frac{i}{S^n - 1}$	$V^n = \frac{1}{S^n}$	$A_{\overline{n}|} = \frac{1 - 1/S^n}{i}$	$\frac{1}{A_{\overline{n}|}} = \frac{i}{1 - 1/S^n}$

YEARS	1 AMOUNT OF ONE	2 AMOUNT OF ONE PER PERIOD	3 SINKING FUND FACTOR	4 PRESENT WORTH OF ONE	5 PRESENT WORTH ONE PER PERIOD	6 PARTIAL PAYMENT
1	1.100 000	1.000 000	1.000 000	.909 091	.909 091	1.100 000
2	1.210 000	2.100 000	.476 190	.826 446	1.735 537	.576 190
3	1.331 000	3.310 000	.302 115	.751 315	2.486 852	.402 115
4	1.464 100	4.641 000	.215 471	.683 013	3.169 865	.315 471
5	1.610 510	6.105 100	.163 797	.620 921	3.790 787	.263 797
6	1.771 561	7.715 610	.129 607	.564 474	4.355 261	.229 607
7	1.948 717	9.487 171	.105 405	.513 158	4.868 419	.205 405
8	2.143 589	11.435 888	.087 444	.466 507	5.334 926	.187 444
9	2.357 948	13.579 477	.073 641	.424 098	5.759 024	.173 641
10	2.593 742	15.937 425	.062 745	.385 543	6.144 567	.162 745
11	2.853 117	18.531 167	.053 963	.350 494	6.495 061	.153 963
12	3.138 428	21.384 284	.046 763	.318 631	6.813 692	.146 763
13	3.452 271	24.522 712	.040 779	.289 664	7.103 356	.140 779
14	3.797 498	27.974 983	.035 746	.263 331	7.366 687	.135 746
15	4.177 248	31.772 482	.031 474	.239 392	7.606 080	.131 474
16	4.594 973	35.949 730	.027 817	.217 629	7.823 709	.127 817
17	5.054 470	40.544 703	.024 664	.197 845	8.021 553	.124 664
18	5.559 917	45.599 173	.021 930	.179 859	8.201 412	.121 930
19	6.115 909	51.159 090	.019 547	.163 508	8.364 920	.119 547
20	6.727 500	57.274 999	.017 460	.148 644	8.513 564	.117 460
21	7.400 250	64.002 499	.015 624	.135 131	8.648 694	.115 624
22	8.140 275	71.402 749	.014 005	.122 846	8.771 540	.114 005
23	8.954 302	79.543 024	.012 572	.111 678	8.883 218	.112 572
24	9.849 733	88.497 327	.011 300	.101 526	8.984 744	.111 300
25	10.834 706	98.347 059	.010 168	.092 296	9.077 040	.110 168
26	11.918 177	109.181 765	.009 159	.083 905	9.160 945	.109 159
27	13.109 994	121.099 942	.008 258	.076 278	9.237 223	.108 258
28	14.420 994	134.209 936	.007 451	.069 343	9.306 567	.107 451
29	15.863 093	148.630 930	.006 728	.063 039	9.369 606	.106 728
30	17.449 402	164.494 023	.006 079	.057 309	9.426 914	.106 079
31	19.194 342	181.943 425	.005 496	.052 099	9.479 013	.105 496
32	21.113 777	201.137 767	.004 972	.047 362	9.526 376	.104 972
33	23.225 154	222.251 544	.004 499	.043 057	9.569 432	.104 499
34	25.547 670	245.476 699	.004 074	.039 143	9.608 575	.104 074
35	28.102 437	271.024 368	.003 690	.035 584	9.644 159	.103 690
36	30.912 681	299.126 805	.003 343	.032 349	9.676 508	.103 343
37	34.003 949	330.039 486	.003 030	.029 408	9.705 917	.103 030
38	37.404 343	364.043 434	.002 747	.026 735	9.732 651	.102 747
39	41.144 778	401.447 778	.002 491	.024 304	9.756 956	.102 491
40	45.259 256	442.592 556	.002 259	.022 095	9.779 051	.102 259
41	49.785 181	487.851 811	.002 050	.020 086	9.799 137	.102 050
42	54.763 699	537.636 992	.001 860	.018 260	9.817 397	.101 860
43	60.240 069	592.400 692	.001 688	.016 600	9.833 998	.101 688
44	66.264 076	652.640 761	.001 532	.015 091	9.849 089	.101 532
45	72.890 484	718.904 837	.001 391	.013 719	9.862 808	.101 391
46	80.179 532	791.795 321	.001 263	.012 472	9.875 280	.101 263
47	88.197 485	871.974 853	.001 147	.011 338	9.886 618	.101 147
48	97.017 234	960.172 338	.001 041	.010 307	9.896 926	.101 041
49	106.718 957	1057.189 572	.000 946	.009 370	9.906 296	.100 946
50	117.390 853	1163.908 529	.000 859	.008 519	9.914 814	.100 859
51	129.129 938	1281.299 382	.000 780	.007 744	9.922 559	.100 780
52	142.042 932	1410.429 320	.000 709	.007 040	9.929 599	.100 709
53	156.247 225	1552.472 252	.000 644	.006 400	9.935 999	.100 644
54	171.871 948	1708.719 477	.000 585	.005 818	9.941 817	.100 585
55	189.059 142	1880.591 425	.000 532	.005 289	9.947 106	.100 532
56	207.965 057	2069.650 567	.000 483	.004 809	9.951 915	.100 483
57	228.761 562	2277.615 624	.000 439	.004 371	9.956 286	.100 439
58	251.637 719	2506.377 186	.000 399	.003 974	9.960 260	.100 399
59	276.801 490	2758.014 905	.000 363	.003 613	9.963 873	.100 363
60	304.481 640	3034.816 395	.000 330	.003 284	9.967 157	.100 330
	$S^n = (1+i)^n$	$S_{\overline{n}\rceil} = \frac{S^n - 1}{i}$	$1/S_{\overline{n}\rceil} = \frac{i}{S^n - 1}$	$V^n = \frac{1}{S^n}$	$A_{\overline{n}\rceil} = \frac{1 - 1/S^n}{i}$	$\frac{1}{A_{\overline{n}\rceil}} = \frac{i}{1 - 1/S^n}$

YEARS	1 AMOUNT OF ONE	2 AMOUNT OF ONE PER PERIOD	3 SINKING FUND FACTOR	4 PRESENT WORTH OF ONE	5 PRESENT WORTH ONE PER PERIOD	6 PARTIAL PAYMENT
1	1.102 500	1.000 000	1.000 000	.907 029	.907 029	1.102 500
2	1.215 506	2.102 500	.475 624	.822 702	1.729 732	.578 124
3	1.340 096	3.318 006	.301 386	.746 215	2.475 947	.403 886
4	1.477 455	4.658 102	.214 680	.676 839	3.152 787	.317 180
5	1.628 895	6.135 557	.162 984	.613 913	3.766 700	.265 484
6	1.795 856	7.764 452	.128 792	.556 837	4.323 537	.231 292
7	1.979 932	9.560 308	.104 599	.505 068	4.828 605	.207 099
8	2.182 875	11.540 240	.086 653	.458 112	5.286 717	.189 153
9	2.406 619	13.723 114	.072 870	.415 521	5.702 238	.175 370
10	2.653 298	16.129 734	.061 997	.376 889	6.079 127	.164 497
11	2.925 261	18.783 031	.053 240	.341 850	6.420 977	.155 740
12	3.225 100	21.708 292	.046 065	.310 068	6.731 045	.148 565
13	3.555 673	24.933 392	.040 107	.281 241	7.012 286	.142 607
14	3.920 129	28.489 065	.035 101	.255 094	7.267 379	.137 601
15	4.321 942	32.409 194	.030 855	.231 377	7.498 757	.133 355
16	4.764 941	36.731 136	.027 225	.209 866	7.708 623	.129 725
17	5.253 348	41.496 078	.024 099	.190 355	7.898 978	.126 599
18	5.791 816	46.749 426	.021 391	.172 657	8.071 635	.123 891
19	6.385 477	52.541 242	.019 033	.156 605	8.228 240	.121 533
20	7.039 989	58.926 719	.016 970	.142 046	8.370 286	.119 470
21	7.761 588	65.966 708	.015 159	.128 840	8.499 126	.117 659
22	8.557 150	73.728 295	.013 563	.116 861	8.615 987	.116 063
23	9.434 258	82.285 446	.012 153	.105 997	8.721 984	.114 653
24	10.401 270	91.719 704	.010 903	.096 142	8.818 126	.113 403
25	11.467 400	102.120 974	.009 792	.087 204	8.905 329	.112 292
26	12.642 808	113.588 373	.008 804	.079 096	8.984 426	.111 304
27	13.938 696	126.231 182	.007 922	.071 743	9.056 169	.110 422
28	15.367 412	140.169 878	.007 134	.065 073	9.121 241	.109 634
29	16.942 572	155.537 290	.006 429	.059 023	9.180 264	.108 929
30	18.679 186	172.479 862	.005 798	.053 536	9.233 800	.108 298
31	20.593 802	191.159 048	.005 231	.048 558	9.282 358	.107 731
32	22.704 667	211.752 851	.004 722	.044 044	9.326 402	.107 222
33	25.031 896	234.457 518	.004 265	.039 949	9.366 351	.106 765
34	27.597 665	259.489 414	.003 854	.036 235	9.402 586	.106 354
35	30.426 426	287.087 078	.003 483	.032 866	9.435 452	.105 983
36	33.545 134	317.513 504	.003 149	.029 811	9.465 263	.105 649
37	36.983 510	351.058 638	.002 849	.027 039	9.492 302	.105 349
38	40.774 320	388.042 148	.002 577	.024 525	9.516 827	.105 077
39	44.953 688	428.816 469	.002 332	.022 245	9.539 072	.104 832
40	49.561 441	473.770 157	.002 111	.020 177	9.559 249	.104 611
41	54.641 489	523.331 598	.001 911	.018 301	9.577 550	.104 411
42	60.242 241	577.973 087	.001 730	.016 600	9.594 150	.104 230
43	66.417 071	638.215 328	.001 567	.015 056	9.609 206	.104 067
44	73.224 821	704.632 399	.001 419	.013 657	9.622 863	.103 919
45	80.730 365	777.857 220	.001 286	.012 387	9.635 250	.103 786
46	89.005 227	858.587 585	.001 165	.011 235	9.646 485	.103 665
47	98.128 263	947.592 813	.001 055	.010 191	9.656 676	.103 555
48	108.186 410	1045.721 076	.000 956	.009 243	9.665 919	.103 456
49	119.275 517	1153.907 486	.000 867	.008 384	9.674 303	.103 367
50	131.501 258	1273.183 003	.000 785	.007 604	9.681 907	.103 285
51	144.980 137	1404.684 261	.000 712	.006 897	9.688 805	.103 212
52	159.840 601	1549.664 398	.000 645	.006 256	9.695 061	.103 145
53	176.224 262	1709.504 999	.000 585	.005 675	9.700 736	.103 085
54	194.287 249	1885.729 261	.000 530	.005 147	9.705 883	.103 030
55	214.201 692	2080.016 510	.000 481	.004 668	9.710 551	.102 981
56	236.157 366	2294.218 203	.000 436	.004 234	9.714 786	.102 936
57	260.363 496	2530.375 569	.000 395	.003 841	9.718 626	.102 895
58	287.050 754	2790.739 064	.000 358	.003 484	9.722 110	.102 858
59	316.473 456	3077.789 818	.000 325	.003 160	9.725 270	.102 825
60	348.911 986	3394.263 275	.000 295	.002 866	9.728 136	.102 795
	$S^n = (1+i)^n$	$S_{\overline{n}|} = \frac{S^n - 1}{i}$	$1/S_{\overline{n}|} = \frac{i}{S^n - 1}$	$V^n = \frac{1}{S^n}$	$A_{\overline{n}|} = \frac{1 - 1/S^n}{i}$	$\frac{1}{A_{\overline{n}|}} = \frac{i}{1 - 1/S^n}$

YEARS	1 AMOUNT OF ONE	2 AMOUNT OF ONE PER PERIOD	3 SINKING FUND FACTOR	4 PRESENT WORTH OF ONE	5 PRESENT WORTH ONE PER PERIOD	6 PARTIAL PAYMENT
1	1.105 000	1.000 000	1.000 000	.904 977	.904 977	1.105 000
2	1.221 025	2.105 000	.475 059	.818 984	1.723 961	.580 059
3	1.349 233	3.326 025	.300 659	.741 162	2.465 123	.405 659
4	1.490 902	4.675 258	.213 892	.670 735	3.135 858	.318 892
5	1.647 447	6.166 160	.162 175	.607 000	3.742 858	.267 175
6	1.820 429	7.813 606	.127 982	.549 321	4.292 179	.232 982
7	2.011 574	9.634 035	.103 799	.497 123	4.789 303	.208 799
8	2.222 789	11.645 609	.085 869	.449 885	5.239 188	.190 869
9	2.456 182	13.868 398	.072 106	.407 136	5.646 324	.177 106
10	2.714 081	16.324 579	.061 257	.368 449	6.014 773	.166 257
11	2.999 059	19.038 660	.052 525	.333 438	6.348 211	.157 525
12	3.313 961	22.037 720	.045 377	.301 754	6.649 964	.150 377
13	3.661 926	25.351 680	.039 445	.273 080	6.923 045	.144 445
14	4.046 429	29.013 607	.034 467	.247 132	7.170 176	.139 467
15	4.471 304	33.060 035	.030 248	.223 648	7.393 825	.135 248
16	4.940 791	37.531 339	.026 644	.202 397	7.596 221	.131 644
17	5.459 574	42.472 130	.023 545	.183 164	7.779 386	.128 545
18	6.032 829	47.931 703	.020 863	.165 760	7.945 146	.125 863
19	6.666 276	53.964 532	.018 531	.150 009	8.095 154	.123 531
20	7.366 235	60.630 808	.016 493	.135 755	8.230 909	.121 493
21	8.139 690	67.997 043	.014 707	.122 855	8.353 764	.119 707
22	8.994 357	76.136 732	.013 134	.111 181	8.464 945	.118 134
23	9.938 764	85.131 089	.011 747	.100 616	8.565 561	.116 747
24	10.982 335	95.069 854	.010 519	.091 055	8.656 616	.115 519
25	12.135 480	106.052 188	.009 429	.082 403	8.739 019	.114 429
26	13.409 705	118.187 668	.008 461	.074 573	8.813 592	.113 461
27	14.817 724	131.597 373	.007 599	.067 487	8.881 079	.112 599
28	16.373 585	146.415 097	.006 830	.061 074	8.942 153	.111 830
29	18.092 812	162.788 683	.006 143	.055 271	8.997 423	.111 143
30	19.992 557	180.881 494	.005 528	.050 019	9.047 442	.110 528
31	22.091 775	200.874 051	.004 978	.045 266	9.092 707	.109 978
32	24.411 412	222.965 827	.004 485	.040 964	9.133 672	.109 485
33	26.974 610	247.377 238	.004 042	.037 072	9.170 744	.109 042
34	29.806 944	274.351 848	.003 645	.033 549	9.204 293	.108 645
35	32.936 673	304.158 792	.003 288	.030 361	9.234 654	.108 288
36	36.395 024	337.095 466	.002 967	.027 476	9.262 131	.107 967
37	40.216 501	373.490 489	.002 677	.024 865	9.286 996	.107 677
38	44.439 234	413.706 991	.002 417	.022 503	9.309 499	.107 417
39	49.105 354	458.146 225	.002 183	.020 364	9.329 863	.107 183
40	54.261 416	507.251 579	.001 971	.018 429	9.348 292	.106 971
41	59.958 864	561.512 994	.001 781	.016 678	9.364 970	.106 781
42	66.254 545	621.471 859	.001 609	.015 093	9.380 064	.106 609
43	73.211 272	687.726 404	.001 454	.013 659	9.393 723	.106 454
44	80.898 456	760.937 676	.001 314	.012 361	9.406 084	.106 314
45	89.392 794	841.836 132	.001 188	.011 187	9.417 271	.106 188
46	98.779 037	931.228 926	.001 074	.010 124	9.427 394	.106 074
47	109.150 836	1030.007 963	.000 971	.009 162	9.436 556	.105 971
48	120.611 674	1139.158 800	.000 878	.008 291	9.444 847	.105 878
49	133.275 900	1259.770 473	.000 794	.007 503	9.452 350	.105 794
50	147.269 869	1393.046 373	.000 718	.006 790	9.459 140	.105 718
51	162.733 205	1540.316 242	.000 649	.006 145	9.465 285	.105 649
52	179.820 192	1703.049 448	.000 587	.005 561	9.470 847	.105 587
53	198.701 312	1882.869 640	.000 531	.005 033	9.475 879	.105 531
54	219.564 950	2081.570 952	.000 480	.004 554	9.480 434	.105 480
55	242.619 270	2301.135 902	.000 435	.004 122	9.484 555	.105 435
56	268.094 293	2543.755 172	.000 393	.003 730	9.488 285	.105 393
57	296.244 194	2811.849 465	.000 356	.003 376	9.491 661	.105 356
58	327.349 834	3108.093 659	.000 322	.003 055	9.494 716	.105 322
59	361.721 567	3435.443 493	.000 291	.002 765	9.497 480	.105 291
60	399.702 331	3797.165 059	.000 263	.002 502	9.499 982	.105 263
	$S^n = (1+i)^n$	$S_{\overline{n}|} = \frac{S^n - 1}{i}$	$1/S_{\overline{n}|} = \frac{i}{S^n - 1}$	$V^n = \frac{1}{S^n}$	$A_{\overline{n}|} = \frac{1 - 1/S^n}{i}$	$\frac{1}{A_{\overline{n}|}} = \frac{i}{1 - 1/S^n}$

YEARS	1 AMOUNT OF ONE	2 AMOUNT OF ONE PER PERIOD	3 SINKING FUND FACTOR	4 PRESENT WORTH OF ONE	5 PRESENT WORTH ONE PER PERIOD	6 PARTIAL PAYMENT
1	1.107 500	1.000 000	1.000 000	.902 935	.902 935	1.107 500
2	1.226 556	2.107 500	.474 496	.815 291	1.718 225	.581 996
3	1.358 411	3.334 056	.299 935	.736 154	2.454 380	.407 435
4	1.504 440	4.692 467	.213 108	.664 699	3.119 079	.320 608
5	1.666 168	6.196 908	.161 371	.600 180	3.719 258	.268 871
6	1.845 281	7.863 075	.127 177	.541 923	4.261 181	.234 677
7	2.043 648	9.708 356	.103 004	.489 321	4.750 502	.210 504
8	2.263 340	11.752 004	.085 092	.441 825	5.192 327	.192 592
9	2.506 650	14.015 344	.071 350	.398 939	5.591 266	.178 850
10	2.776 114	16.521 994	.060 525	.360 216	5.951 482	.168 025
11	3.074 547	19.298 108	.051 819	.325 251	6.276 733	.159 319
12	3.405 060	22.372 655	.044 697	.293 681	6.570 414	.152 197
13	3.771 104	25.777 715	.038 793	.265 174	6.835 588	.146 293
14	4.176 498	29.548 820	.033 842	.239 435	7.075 023	.141 342
15	4.625 472	33.725 318	.029 651	.216 194	7.291 217	.137 151
16	5.122 710	38.350 789	.026 075	.195 209	7.486 426	.133 575
17	5.673 401	43.473 499	.023 003	.176 261	7.662 687	.130 503
18	6.283 292	49.146 900	.020 347	.159 152	7.821 840	.127 847
19	6.958 746	55.430 192	.018 041	.143 704	7.965 544	.125 541
20	7.706 811	62.388 938	.016 028	.129 755	8.095 299	.123 528
21	8.535 293	70.095 749	.014 266	.117 161	8.212 460	.121 766
22	9.452 837	78.631 042	.012 718	.105 788	8.318 248	.120 218
23	10.469 017	88.083 879	.011 353	.095 520	8.413 768	.118 853
24	11.594 436	98.552 895	.010 147	.086 248	8.500 016	.117 647
25	12.840 838	110.147 332	.009 079	.077 877	8.577 893	.116 579
26	14.221 228	122.988 170	.008 131	.070 317	8.648 210	.115 631
27	15.750 010	137.209 398	.007 288	.063 492	8.711 702	.114 788
28	17.443 136	152.959 408	.006 538	.057 329	8.769 031	.114 038
29	19.318 274	170.402 545	.005 868	.051 764	8.820 796	.113 368
30	21.394 988	189.720 818	.005 271	.046 740	8.867 536	.112 771
31	23.694 949	211.115 806	.004 737	.042 203	8.909 739	.112 237
32	26.242 156	234.810 756	.004 259	.038 107	8.947 845	.111 759
33	29.063 188	261.052 912	.003 831	.034 408	8.982 253	.111 331
34	32.187 481	290.116 100	.003 447	.031 068	9.013 321	.110 947
35	35.647 635	322.303 581	.003 103	.028 052	9.041 373	.110 603
36	39.479 756	357.951 215	.002 794	.025 329	9.066 703	.110 294
37	43.723 829	397.430 971	.002 516	.022 871	9.089 574	.110 016
38	48.424 141	441.154 801	.002 267	.020 651	9.110 225	.109 767
39	53.629 736	489.578 942	.002 043	.018 646	9.128 871	.109 543
40	59.394 933	543.208 678	.001 841	.016 836	9.145 707	.109 341
41	65.779 888	602.603 611	.001 659	.015 202	9.160 910	.109 159
42	72.851 226	668.383 499	.001 496	.013 727	9.174 636	.108 996
43	80.682 733	741.234 725	.001 349	.012 394	9.187 030	.108 849
44	89.356 127	821.917 458	.001 217	.011 191	9.198 222	.108 717
45	98.961 910	911.273 585	.001 097	.010 105	9.208 327	.108 597
46	109.600 316	1010.235 495	.000 990	.009 124	9.217 451	.108 490
47	121.382 350	1119.835 811	.000 893	.008 238	9.225 689	.108 393
48	134.430 952	1241.218 160	.000 806	.007 439	9.233 128	.108 306
49	148.882 280	1375.649 113	.000 727	.006 717	9.239 845	.108 227
50	164.887 125	1524.531 392	.000 656	.006 065	9.245 909	.108 156
51	182.612 491	1689.418 517	.000 592	.005 476	9.251 385	.108 092
52	202.243 333	1872.031 007	.000 534	.004 945	9.256 330	.108 034
53	223.984 492	2074.274 341	.000 482	.004 465	9.260 794	.107 982
54	248.062 824	2298.258 832	.000 435	.004 031	9.264 826	.107 935
55	274.729 578	2546.321 657	.000 393	.003 640	9.268 466	.107 893
56	304.263 008	2821.051 235	.000 354	.003 287	9.271 752	.107 854
57	336.971 281	3125.314 243	.000 320	.002 968	9.274 720	.107 820
58	373.195 694	3462.285 524	.000 289	.002 680	9.277 399	.107 789
59	413.314 231	3835.481 218	.000 261	.002 419	9.279 819	.107 761
60	457.745 511	4248.795 449	.000 235	.002 185	9.282 004	.107 735
	$S^n = (1+i)^n$	$S_{\overline{n}} = \frac{S^n - 1}{i}$	$1/S_{\overline{n}} = \frac{i}{S^n - 1}$	$V^n = \frac{1}{S^n}$	$A_{\overline{n}} = \frac{1 - 1/S^n}{i}$	$\frac{1}{A_{\overline{n}}} = \frac{i}{1 - 1/S^n}$

YEARS	1 AMOUNT OF ONE	2 AMOUNT OF ONE PER PERIOD	3 SINKING FUND FACTOR	4 PRESENT WORTH OF ONE	5 PRESENT WORTH ONE PER PERIOD	6 PARTIAL PAYMENT
1	1.110 000	1.000 000	1.000 000	.900 901	.900 901	1.110 000
2	1.232 100	2.110 000	.473 934	.811 622	1.712 523	.583 934
3	1.367 631	3.342 100	.299 213	.731 191	2.443 715	.409 213
4	1.518 070	4.709 731	.212 326	.658 731	3.102 446	.322 326
5	1.685 058	6.227 801	.160 570	.593 451	3.695 897	.270 570
6	1.870 415	7.912 860	.126 377	.534 641	4.230 538	.236 377
7	2.076 160	9.783 274	.102 215	.481 658	4.712 196	.212 215
8	2.304 538	11.859 434	.084 321	.433 926	5.146 123	.194 321
9	2.558 037	14.163 972	.070 602	.390 925	5.537 048	.180 602
10	2.839 421	16.722 009	.059 801	.352 184	5.889 232	.169 801
11	3.151 757	19.561 430	.051 121	.317 283	6.206 515	.161 121
12	3.498 451	22.713 187	.044 027	.285 841	6.492 356	.154 027
13	3.883 280	26.211 638	.038 151	.257 514	6.749 870	.148 151
14	4.310 441	30.094 918	.033 228	.231 995	6.981 865	.143 228
15	4.784 589	34.405 359	.029 065	.209 004	7.190 870	.139 065
16	5.310 894	39.189 948	.025 517	.188 292	7.379 162	.135 517
17	5.895 093	44.500 843	.022 471	.169 633	7.548 794	.132 471
18	6.543 553	50.395 936	.019 843	.152 822	7.701 617	.129 843
19	7.263 344	56.939 488	.017 563	.137 678	7.839 294	.127 563
20	8.062 312	64.202 832	.015 576	.124 034	7.963 328	.125 576
21	8.949 166	72.265 144	.013 838	.111 742	8.075 070	.123 838
22	9.933 574	81.214 309	.012 313	.100 669	8.175 739	.122 313
23	11.026 267	91.147 884	.010 971	.090 693	8.266 432	.120 971
24	12.239 157	102.174 151	.009 787	.081 705	8.348 137	.119 787
25	13.585 464	114.413 307	.008 740	.073 608	8.421 745	.118 740
26	15.079 865	127.998 771	.007 813	.066 314	8.488 058	.117 813
27	16.738 650	143.078 636	.006 989	.059 742	8.547 800	.116 989
28	18.579 901	159.817 286	.006 257	.053 822	8.601 622	.116 257
29	20.623 691	178.397 187	.005 605	.048 488	8.650 110	.115 605
30	22.892 297	199.020 878	.005 025	.043 683	8.693 793	.115 025
31	25.410 449	221.913 174	.004 506	.039 354	8.733 146	.114 506
32	28.205 599	247.323 624	.004 043	.035 454	8.768 600	.114 043
33	31.308 214	275.529 222	.003 629	.031 940	8.800 541	.113 629
34	34.752 118	306.837 437	.003 259	.028 775	8.829 316	.113 259
35	38.574 851	341.589 555	.002 927	.025 924	8.855 240	.112 927
36	42.818 085	380.164 406	.002 630	.023 355	8.878 594	.112 630
37	47.528 074	422.982 490	.002 364	.021 040	8.899 635	.112 364
38	52.756 162	470.510 564	.002 125	.018 955	8.918 590	.112 125
39	58.559 340	523.266 726	.001 911	.017 077	8.935 666	.111 911
40	65.000 867	581.826 066	.001 719	.015 384	8.951 051	.111 719
41	72.150 963	646.826 934	.001 546	.013 860	8.964 911	.111 546
42	80.087 569	718.977 896	.001 391	.012 486	8.977 397	.111 391
43	88.897 201	799.065 465	.001 251	.011 249	8.988 646	.111 251
44	98.675 893	887.962 666	.001 126	.010 134	8.998 780	.111 126
45	109.530 242	986.638 559	.001 014	.009 130	9.007 910	.111 014
46	121.578 568	1096.168 801	.000 912	.008 225	9.016 135	.110 912
47	134.952 211	1217.747 369	.000 821	.007 410	9.023 545	.110 821
48	149.796 954	1352.699 580	.000 739	.006 676	9.030 221	.110 739
49	166.274 619	1502.496 533	.000 666	.006 014	9.036 235	.110 666
50	184.564 827	1668.771 152	.000 599	.005 418	9.041 653	.110 599
51	204.866 958	1853.335 979	.000 540	.004 881	9.046 534	.110 540
52	227.402 323	2058.202 937	.000 486	.004 397	9.050 932	.110 486
53	252.416 579	2285.605 260	.000 438	.003 962	9.054 894	.110 438
54	280.182 402	2538.021 838	.000 394	.003 569	9.058 463	.110 394
55	311.002 466	2818.204 240	.000 355	.003 215	9.061 678	.110 355
56	345.212 738	3129.206 707	.000 320	.002 897	9.064 575	.110 320
57	383.186 139	3474.419 445	.000 288	.002 610	9.067 185	.110 288
58	425.336 614	3857.605 583	.000 259	.002 351	9.069 536	.110 259
59	472.123 642	4282.942 198	.000 233	.002 118	9.071 654	.110 233
60	524.057 242	4755.065 839	.000 210	.001 908	9.073 562	.110 210
	$S^n = (1+i)^n$	$S_{\overline{n}|} = \frac{S^n - 1}{i}$	$1/S_{\overline{n}|} = \frac{i}{S^n - 1}$	$V^n = \frac{1}{S^n}$	$A_{\overline{n}|} = \frac{1 - 1/S^n}{i}$	$\frac{1}{A_{\overline{n}|}} = \frac{i}{1 - 1/S^n}$

YEARS	1 AMOUNT OF ONE	2 AMOUNT OF ONE PER PERIOD	3 SINKING FUND FACTOR	4 PRESENT WORTH OF ONE	5 PRESENT WORTH ONE PER PERIOD	6 PARTIAL PAYMENT
1	1.112 500	1.000 000	1.000 000	.898 876	.898 876	1.112 500
2	1.237 656	2.112 500	.473 373	.807 979	1.706 855	.585 873
3	1.376 893	3.350 156	.298 494	.726 273	2.433 128	.410 994
4	1.531 793	4.727 049	.211 548	.652 830	3.085 958	.324 048
5	1.704 120	6.258 842	.159 774	.586 813	3.672 771	.272 274
6	1.895 833	7.962 962	.125 581	.527 473	4.200 244	.238 081
7	2.109 114	9.858 795	.101 432	.474 133	4.674 376	.213 932
8	2.346 390	11.967 909	.083 557	.426 187	5.100 563	.196 057
9	2.610 359	14.314 299	.069 860	.383 089	5.483 652	.182 360
10	2.904 024	16.924 657	.059 085	.344 350	5.828 002	.171 585
11	3.230 727	19.828 681	.050 432	.309 528	6.137 530	.162 932
12	3.594 183	23.059 408	.043 366	.278 227	6.415 757	.155 866
13	3.998 529	26.653 592	.037 518	.250 092	6.665 849	.150 018
14	4.448 364	30.652 121	.032 624	.224 802	6.890 651	.145 124
15	4.948 804	35.100 484	.028 490	.202 069	7.092 720	.140 990
16	5.505 545	40.049 289	.024 969	.181 635	7.274 355	.137 469
17	6.124 919	45.554 834	.021 952	.163 267	7.437 622	.134 452
18	6.813 972	51.679 752	.019 350	.146 757	7.584 380	.131 850
19	7.580 544	58.493 725	.017 096	.131 917	7.716 296	.129 596
20	8.433 355	66.074 269	.015 134	.118 577	7.834 873	.127 634
21	9.382 108	74.507 624	.013 421	.106 586	7.941 459	.125 921
22	10.437 595	83.889 731	.011 920	.095 808	8.037 267	.124 420
23	11.611 824	94.327 326	.010 601	.086 119	8.123 386	.123 101
24	12.918 154	105.939 150	.009 439	.077 410	8.200 796	.121 939
25	14.371 447	118.857 305	.008 413	.069 582	8.270 379	.120 913
26	15.988 235	133.228 752	.007 506	.062 546	8.332 925	.120 006
27	17.786 911	149.216 986	.006 702	.056 221	8.389 146	.119 202
28	19.787 938	167.003 897	.005 988	.050 536	8.439 681	.118 488
29	22.014 081	186.791 836	.005 354	.045 425	8.485 107	.117 854
30	24.490 666	208.805 917	.004 789	.040 832	8.525 939	.117 289
31	27.245 866	233.296 583	.004 286	.036 703	8.562 642	.116 786
32	30.311 025	260.542 448	.003 838	.032 991	8.595 633	.116 338
33	33.721 016	290.853 474	.003 438	.029 655	8.625 288	.115 938
34	37.514 630	324.574 489	.003 081	.026 656	8.651 944	.115 581
35	41.735 026	362.089 120	.002 762	.023 961	8.675 905	.115 262
36	46.430 216	403.824 145	.002 476	.021 538	8.697 443	.114 976
37	51.653 616	450.254 362	.002 221	.019 360	8.716 802	.114 721
38	57.464 647	501.907 978	.001 992	.017 402	8.734 204	.114 492
39	63.929 420	559.372 625	.001 788	.015 642	8.749 847	.114 288
40	71.121 480	623.302 045	.001 604	.014 060	8.763 907	.114 104
41	79.122 647	694.423 525	.001 440	.012 639	8.776 546	.113 940
42	88.023 944	773.546 172	.001 293	.011 361	8.787 906	.113 793
43	97.926 638	861.570 116	.001 161	.010 212	8.798 118	.113 661
44	108.943 385	959.496 755	.001 042	.009 179	8.807 297	.113 542
45	121.199 516	1068.440 139	.000 936	.008 251	8.815 548	.113 436
46	134.834 461	1189.639 655	.000 841	.007 417	8.822 964	.113 341
47	150.003 338	1324.474 116	.000 755	.006 667	8.829 631	.113 255
48	166.878 714	1474.477 454	.000 678	.005 992	8.835 623	.113 178
49	185.652 569	1641.356 168	.000 609	.005 386	8.841 010	.113 109
50	206.538 483	1827.008 737	.000 547	.004 842	8.845 851	.113 047
51	229.774 062	2033.547 220	.000 492	.004 352	8.850 204	.112 992
52	255.623 644	2263.321 282	.000 442	.003 912	8.854 116	.112 942
53	284.381 304	2518.944 926	.000 397	.003 516	8.857 632	.112 897
54	316.374 201	2803.326 230	.000 357	.003 161	8.860 793	.112 857
55	351.966 299	3119.700 431	.000 321	.002 841	8.863 634	.112 821
56	391.562 507	3471.666 730	.000 288	.002 554	8.866 188	.112 788
57	435.613 289	3863.229 237	.000 259	.002 296	8.868 483	.112 759
58	484.619 784	4298.842 526	.000 233	.002 063	8.870 547	.112 733
59	539.139 510	4783.462 310	.000 209	.001 855	8.872 402	.112 709
60	599.792 705	5322.601 820	.000 188	.001 667	8.874 069	.112 688
	$S^n = (1+i)^n$	$S_{\overline{n}|} = \frac{S^n - 1}{i}$	$1/S_{\overline{n}|} = \frac{i}{S^n - 1}$	$V^n = \frac{1}{S^n}$	$A_{\overline{n}|} = \frac{1 - 1/S^n}{i}$	$\frac{1}{A_{\overline{n}|}} = \frac{i}{1 - 1/S^n}$

YEARS	1 AMOUNT OF ONE	2 AMOUNT OF ONE PER PERIOD	3 SINKING FUND FACTOR	4 PRESENT WORTH OF ONE	5 PRESENT WORTH ONE PER PERIOD	6 PARTIAL PAYMENT
1	1.115 000	1.000 000	1.000 000	.896 861	.896 861	1.115 000
2	1.243 225	2.115 000	.472 813	.804 360	1.701 221	.587 813
3	1.386 196	3.358 225	.297 776	.721 399	2.422 619	.412 776
4	1.545 608	4.744 421	.210 774	.646 994	3.069 614	.325 774
5	1.723 353	6.290 029	.158 982	.580 264	3.649 878	.273 982
6	1.921 539	8.013 383	.124 791	.520 416	4.170 294	.239 791
7	2.142 516	9.934 922	.100 655	.466 741	4.637 035	.215 655
8	2.388 905	12.077 438	.082 799	.418 602	5.055 637	.197 799
9	2.663 629	14.466 343	.069 126	.375 428	5.431 064	.184 126
10	2.969 947	17.129 972	.058 377	.336 706	5.767 771	.173 377
11	3.311 491	20.099 919	.049 751	.301 979	6.069 750	.164 751
12	3.692 312	23.411 410	.042 714	.270 833	6.340 583	.157 714
13	4.116 928	27.103 722	.036 895	.242 900	6.583 482	.151 895
14	4.590 375	31.220 650	.032 030	.217 847	6.801 329	.147 030
15	5.118 268	35.811 025	.027 924	.195 379	6.996 708	.142 924
16	5.706 869	40.929 293	.024 432	.175 227	7.171 935	.139 432
17	6.363 159	46.636 161	.021 443	.157 155	7.329 090	.136 443
18	7.094 922	52.999 320	.018 868	.140 946	7.470 036	.133 868
19	7.910 838	60.094 242	.016 641	.126 409	7.596 445	.131 641
20	8.820 584	68.005 080	.014 705	.113 371	7.709 816	.129 705
21	9.834 951	76.825 664	.013 016	.101 678	7.811 494	.128 016
22	10.965 971	86.660 615	.011 539	.091 191	7.902 685	.126 539
23	12.227 057	97.626 586	.010 243	.081 786	7.984 471	.125 243
24	13.633 169	109.853 643	.009 103	.073 351	8.057 822	.124 103
25	15.200 983	123.486 812	.008 098	.065 785	8.123 607	.123 098
26	16.949 096	138.687 796	.007 210	.059 000	8.182 607	.122 210
27	18.898 243	155.636 892	.006 425	.052 915	8.235 522	.121 425
28	21.071 540	174.535 135	.005 730	.047 457	8.282 979	.120 730
29	23.494 768	195.606 675	.005 112	.042 563	8.325 542	.120 112
30	26.196 666	219.101 443	.004 564	.038 173	8.363 715	.119 564
31	29.209 282	245.298 109	.004 077	.034 236	8.397 951	.119 077
32	32.568 350	274.507 391	.003 643	.030 705	8.428 655	.118 643
33	36.313 710	307.075 741	.003 257	.027 538	8.456 193	.118 257
34	40.489 787	343.389 451	.002 912	.024 698	8.480 891	.117 912
35	45.146 112	383.879 238	.002 605	.022 150	8.503 041	.117 605
36	50.337 915	429.025 351	.002 331	.019 866	8.522 907	.117 331
37	56.126 776	479.363 266	.002 086	.017 817	8.540 723	.117 086
38	62.581 355	535.490 042	.001 867	.015 979	8.556 703	.116 867
39	69.778 211	598.071 396	.001 672	.014 331	8.571 034	.116 672
40	77.802 705	667.849 607	.001 497	.012 853	8.583 887	.116 497
41	86.750 016	745.652 312	.001 341	.011 527	8.595 414	.116 341
42	96.726 268	832.402 327	.001 201	.010 338	8.605 753	.116 201
43	107.849 788	929.128 595	.001 076	.009 272	8.615 025	.116 076
44	120.252 514	1036.978 384	.000 964	.008 316	8.623 341	.115 964
45	134.081 553	1157.230 898	.000 864	.007 458	8.630 799	.115 864
46	149.500 932	1291.312 451	.000 774	.006 689	8.637 488	.115 774
47	166.693 539	1440.813 383	.000 694	.005 999	8.643 487	.115 694
48	185.863 296	1607.506 922	.000 622	.005 380	8.648 867	.115 622
49	207.237 575	1793.370 218	.000 558	.004 825	8.653 692	.115 558
50	231.069 896	2000.607 793	.000 500	.004 328	8.658 020	.115 500
51	257.642 934	2231.677 689	.000 448	.003 881	8.661 901	.115 448
52	287.271 872	2489.320 623	.000 402	.003 481	8.665 382	.115 402
53	320.308 137	2776.592 495	.000 360	.003 122	8.668 504	.115 360
54	357.143 573	3096.900 632	.000 323	.002 800	8.671 304	.115 323
55	398.215 084	3454.044 205	.000 290	.002 511	8.673 816	.115 290
56	444.009 818	3852.259 288	.000 260	.002 252	8.676 068	.115 260
57	495.070 947	4296.269 106	.000 233	.002 020	8.678 088	.115 233
58	552.004 106	4791.340 053	.000 209	.001 812	8.679 899	.115 209
59	615.484 578	5343.344 159	.000 187	.001 625	8.681 524	.115 187
60	686.265 305	5958.828 738	.000 168	.001 457	8.682 981	.115 168
	$S^n = (1+i)^n$	$S_{\overline{n}\rceil} = \frac{S^n - 1}{i}$	$1/S_{\overline{n}\rceil} = \frac{i}{S^n - 1}$	$V^n = \frac{1}{S^n}$	$A_{\overline{n}\rceil} = \frac{1 - 1/S^n}{i}$	$\frac{1}{A_{\overline{n}\rceil}} = \frac{i}{1 - 1/S^n}$

YEARS	1 AMOUNT OF ONE	2 AMOUNT OF ONE PER PERIOD	3 SINKING FUND FACTOR	4 PRESENT WORTH OF ONE	5 PRESENT WORTH ONE PER PERIOD	6 PARTIAL PAYMENT
1	1.117 500	1.000 000	1.000 000	.894 855	.894 855	1.117 500
2	1.248 806	2.117 500	.472 255	.800 765	1.695 619	.589 755
3	1.395 541	3.366 306	.297 062	.716 568	2.412 187	.414 562
4	1.559 517	4.761 847	.210 003	.641 224	3.053 411	.327 503
5	1.742 760	6.321 364	.158 194	.573 802	3.627 214	.275 694
6	1.947 535	8.064 125	.124 006	.513 470	4.140 684	.241 506
7	2.176 370	10.011 659	.099 884	.459 481	4.600 164	.217 384
8	2.432 093	12.188 029	.082 048	.411 168	5.011 333	.199 548
9	2.717 864	14.620 123	.068 399	.367 936	5.379 269	.185 899
10	3.037 213	17.337 987	.057 677	.329 249	5.708 518	.175 177
11	3.394 086	20.375 200	.049 079	.294 630	6.003 148	.166 579
12	3.792 891	23.769 287	.042 071	.263 651	6.266 799	.159 571
13	4.238 556	27.562 178	.036 282	.235 929	6.502 728	.153 782
14	4.736 586	31.800 734	.031 446	.211 123	6.713 851	.148 946
15	5.293 135	36.537 320	.027 369	.188 924	6.902 775	.144 869
16	5.915 078	41.830 455	.023 906	.169 059	7.071 834	.141 406
17	6.610 100	47.745 533	.020 944	.151 284	7.223 118	.138 444
18	7.386 787	54.355 634	.018 397	.135 377	7.358 495	.135 897
19	8.254 734	61.742 420	.016 196	.121 143	7.479 637	.133 696
20	9.224 666	69.997 155	.014 286	.108 405	7.588 042	.131 786
21	10.308 564	79.221 821	.012 623	.097 007	7.685 049	.130 123
22	11.519 820	89.530 384	.011 169	.086 807	7.771 856	.128 669
23	12.873 399	101.050 205	.009 896	.077 680	7.849 536	.127 396
24	14.386 023	113.923 604	.008 778	.069 512	7.919 048	.126 278
25	16.076 381	128.309 627	.007 794	.062 203	7.981 251	.125 294
26	17.965 356	144.386 008	.006 926	.055 663	8.036 913	.124 426
27	20.076 285	162.351 364	.006 159	.049 810	8.086 723	.123 659
28	22.435 249	182.427 650	.005 482	.044 573	8.131 296	.122 982
29	25.071 391	204.862 898	.004 881	.039 886	8.171 182	.122 381
30	28.017 279	229.934 289	.004 349	.035 692	8.206 874	.121 849
31	31.309 309	257.951 568	.003 877	.031 939	8.238 814	.121 377
32	34.988 153	289.260 877	.003 457	.028 581	8.267 395	.120 957
33	39.099 261	324.249 030	.003 084	.025 576	8.292 971	.120 584
34	43.693 424	363.348 291	.002 752	.022 887	8.315 858	.120 252
35	48.827 402	407.041 715	.002 457	.020 480	8.336 338	.119 957
36	54.564 621	455.869 117	.002 194	.018 327	8.354 665	.119 694
37	60.975 964	510.433 738	.001 959	.016 400	8.371 065	.119 459
38	68.140 640	571.409 702	.001 750	.014 676	8.385 740	.119 250
39	76.147 165	639.550 343	.001 564	.013 132	8.398 873	.119 064
40	85.094 457	715.697 508	.001 397	.011 752	8.410 624	.118 897
41	95.093 056	800.791 965	.001 249	.010 516	8.421 140	.118 749
42	106.266 490	895.885 021	.001 116	.009 410	8.430 551	.118 616
43	118.752 803	1002.151 511	.000 998	.008 421	8.438 971	.118 498
44	132.706 257	1120.904 313	.000 892	.007 535	8.446 507	.118 392
45	148.299 242	1253.610 570	.000 798	.006 743	8.453 250	.118 298
46	165.724 403	1401.909 812	.000 713	.006 034	8.459 284	.118 213
47	185.197 020	1567.634 215	.000 638	.005 400	8.464 684	.118 138
48	206.957 670	1752.831 235	.000 571	.004 832	8.469 516	.118 071
49	231.275 196	1959.788 905	.000 510	.004 324	8.473 840	.118 010
50	258.450 032	2191.064 102	.000 456	.003 869	8.477 709	.117 956
51	288.817 911	2449.514 134	.000 408	.003 462	8.481 171	.117 908
52	322.754 015	2738.332 044	.000 365	.003 098	8.484 269	.117 865
53	360.677 612	3061.086 060	.000 327	.002 773	8.487 042	.117 827
54	403.057 231	3421.763 672	.000 292	.002 481	8.489 523	.117 792
55	450.416 456	3824.820 903	.000 261	.002 220	8.491 743	.117 761
56	503.340 390	4275.237 359	.000 234	.001 987	8.493 730	.117 734
57	562.482 885	4778.577 749	.000 209	.001 778	8.495 508	.117 709
58	628.574 625	5341.060 634	.000 187	.001 591	8.497 099	.117 687
59	702.432 143	5969.635 259	.000 168	.001 424	8.498 522	.117 668
60	784.967 920	6672.067 402	.000 150	.001 274	8.499 796	.117 650
	$S^n = (1+i)^n$	$S_{\overline{n}|} = \frac{S^n - 1}{i}$	$1/S_{\overline{n}|} = \frac{i}{S^n - 1}$	$V^n = \frac{1}{S^n}$	$A_{\overline{n}|} = \frac{1 - 1/S^n}{i}$	$\frac{1}{A_{\overline{n}|}} = \frac{i}{1 - 1/S^n}$

YEARS	1 AMOUNT OF ONE	2 AMOUNT OF ONE PER PERIOD	3 SINKING FUND FACTOR	4 PRESENT WORTH OF ONE	5 PRESENT WORTH ONE PER PERIOD	6 PARTIAL PAYMENT
1	1.120 000	1.000 000	1.000 000	.892 857	.892 857	1.120 000
2	1.254 400	2.120 000	.471 698	.797 194	1.690 051	.591 698
3	1.404 928	3.374 400	.296 349	.711 780	2.401 831	.416 349
4	1.573 519	4.779 328	.209 234	.635 518	3.037 349	.329 234
5	1.762 342	6.352 847	.157 410	.567 427	3.604 776	.277 410
6	1.973 823	8.115 189	.123 226	.506 631	4.111 407	.243 226
7	2.210 681	10.089 012	.099 118	.452 349	4.563 757	.219 118
8	2.475 963	12.299 693	.081 303	.403 883	4.967 640	.201 303
9	2.773 079	14.775 656	.067 679	.360 610	5.328 250	.187 679
10	3.105 848	17.548 735	.056 984	.321 973	5.650 223	.176 984
11	3.478 550	20.654 583	.048 415	.287 476	5.937 699	.168 415
12	3.895 976	24.133 133	.041 437	.256 675	6.194 374	.161 437
13	4.363 493	28.029 109	.035 677	.229 174	6.423 548	.155 677
14	4.887 112	32.392 602	.030 871	.204 620	6.628 168	.150 871
15	5.473 566	37.279 715	.026 824	.182 696	6.810 864	.146 824
16	6.130 394	42.753 280	.023 390	.163 122	6.973 986	.143 390
17	6.866 041	48.883 674	.020 457	.145 644	7.119 630	.140 457
18	7.689 966	55.749 715	.017 937	.130 040	7.249 670	.137 937
19	8.612 762	63.439 681	.015 763	.116 107	7.365 777	.135 763
20	9.646 293	72.052 442	.013 879	.103 667	7.469 444	.133 879
21	10.803 848	81.698 736	.012 240	.092 560	7.562 003	.132 240
22	12.100 310	92.502 584	.010 811	.082 643	7.644 646	.130 811
23	13.552 347	104.602 894	.009 560	.073 788	7.718 434	.129 560
24	15.178 629	118.155 241	.008 463	.065 882	7.784 316	.128 463
25	17.000 064	133.333 870	.007 500	.058 823	7.843 139	.127 500
26	19.040 072	150.333 934	.006 652	.052 521	7.895 660	.126 652
27	21.324 881	169.374 007	.005 904	.046 894	7.942 554	.125 904
28	23.883 866	190.698 887	.005 244	.041 869	7.984 423	.125 244
29	26.749 930	214.582 754	.004 660	.037 383	8.021 806	.124 660
30	29.959 922	241.332 684	.004 144	.033 378	8.055 184	.124 144
31	33.555 113	271.292 606	.003 686	.029 802	8.084 986	.123 686
32	37.581 726	304.847 719	.003 280	.026 609	8.111 594	.123 280
33	42.091 533	342.429 446	.002 920	.023 758	8.135 352	.122 920
34	47.142 517	384.520 979	.002 601	.021 212	8.156 564	.122 601
35	52.799 620	431.663 496	.002 317	.018 940	8.175 504	.122 317
36	59.135 574	484.463 116	.002 064	.016 910	8.192 414	.122 064
37	66.231 843	543.598 690	.001 840	.015 098	8.207 513	.121 840
38	74.179 664	609.830 533	.001 640	.013 481	8.220 993	.121 640
39	83.081 224	684.010 197	.001 462	.012 036	8.233 030	.121 462
40	93.050 970	767.091 420	.001 304	.010 747	8.243 777	.121 304
41	104.217 087	860.142 391	.001 163	.009 595	8.253 372	.121 163
42	116.723 137	964.359 478	.001 037	.008 567	8.261 939	.121 037
43	130.729 914	1081.082 615	.000 925	.007 649	8.269 589	.120 925
44	146.417 503	1211.812 529	.000 825	.006 830	8.276 418	.120 825
45	163.987 604	1358.230 032	.000 736	.006 098	8.282 516	.120 736
46	183.666 116	1522.217 636	.000 657	.005 445	8.287 961	.120 657
47	205.706 050	1705.883 752	.000 586	.004 861	8.292 822	.120 586
48	230.390 776	1911.589 803	.000 523	.004 340	8.297 163	.120 523
49	258.037 669	2141.980 579	.000 467	.003 875	8.301 038	.120 467
50	289.002 190	2400.018 249	.000 417	.003 460	8.304 498	.120 417
51	323.682 453	2689.020 438	.000 372	.003 089	8.307 588	.120 372
52	362.524 347	3012.702 891	.000 332	.002 758	8.310 346	.120 332
53	406.027 269	3375.227 238	.000 296	.002 463	8.312 809	.120 296
54	454.750 541	3781.254 506	.000 264	.002 199	8.315 008	.120 264
55	509.320 606	4236.005 047	.000 236	.001 963	8.316 972	.120 236
56	570.439 078	4745.325 653	.000 211	.001 753	8.318 725	.120 211
57	638.891 768	5315.764 731	.000 188	.001 565	8.320 290	.120 188
58	715.558 780	5954.656 499	.000 168	.001 398	8.321 687	.120 168
59	801.425 833	6670.215 279	.000 150	.001 248	8.322 935	.120 150
60	897.596 933	7471.641 112	.000 134	.001 114	8.324 049	.120 134
	$S^n = (1+i)^n$	$S_{\overline{n}|} = \frac{S^n - 1}{i}$	$1/S_{\overline{n}|} = \frac{i}{S^n - 1}$	$V^n = \frac{1}{S^n}$	$A_{\overline{n}|} = \frac{1 - 1/S^n}{i}$	$\frac{1}{A_{\overline{n}|}} = \frac{i}{1 - 1/S^n}$

YEARS	1 AMOUNT OF ONE	2 AMOUNT OF ONE PER PERIOD	3 SINKING FUND FACTOR	4 PRESENT WORTH OF ONE	5 PRESENT WORTH ONE PER PERIOD	6 PARTIAL PAYMENT
1	1.122 500	1.000 000	1.000 000	.890 869	.890 869	1.122 500
2	1.260 006	2.122 500	.471 143	.793 647	1.684 515	.593 643
3	1.414 357	3.382 506	.295 639	.707 035	2.391 551	.418 139
4	1.587 616	4.796 863	.208 470	.629 875	3.021 426	.330 970
5	1.782 099	6.384 479	.156 630	.561 136	3.582 562	.279 130
6	2.000 406	8.166 578	.122 450	.499 899	4.082 461	.244 950
7	2.245 455	10.166 983	.098 358	.445 344	4.527 805	.220 858
8	2.520 524	12.412 439	.080 564	.396 743	4.924 547	.203 064
9	2.829 288	14.932 963	.066 966	.353 446	5.277 993	.189 466
10	3.175 876	17.762 251	.056 299	.314 874	5.592 867	.178 799
11	3.564 920	20.938 126	.047 760	.280 511	5.873 378	.170 260
12	4.001 623	24.503 047	.040 811	.249 899	6.123 277	.163 311
13	4.491 822	28.504 670	.035 082	.222 627	6.345 904	.157 582
14	5.042 070	32.996 492	.030 306	.198 331	6.544 235	.152 806
15	5.659 724	38.038 562	.026 289	.176 687	6.720 922	.148 789
16	6.353 040	43.698 286	.022 884	.157 405	6.878 327	.145 384
17	7.131 287	50.051 326	.019 979	.140 227	7.018 554	.142 479
18	8.004 870	57.182 614	.017 488	.124 924	7.143 478	.139 988
19	8.985 467	65.187 484	.015 340	.111 291	7.254 769	.137 840
20	10.086 186	74.172 951	.013 482	.099 145	7.353 914	.135 982
21	11.321 744	84.259 137	.011 868	.088 326	7.442 240	.134 368
22	12.708 658	95.580 882	.010 462	.078 687	7.520 926	.132 962
23	14.265 469	108.289 540	.009 235	.070 099	7.591 026	.131 735
24	16.012 989	122.555 008	.008 160	.062 449	7.653 475	.130 660
25	17.974 580	138.567 997	.007 217	.055 634	7.709 109	.129 717
26	20.176 466	156.542 576	.006 388	.049 563	7.758 672	.128 888
27	22.648 083	176.719 042	.005 659	.044 154	7.802 826	.128 159
28	25.422 473	199.367 125	.005 016	.039 335	7.842 161	.127 516
29	28.536 726	224.789 597	.004 449	.035 043	7.877 204	.126 949
30	32.032 475	253.326 323	.003 947	.031 218	7.908 422	.126 447
31	35.956 453	285.358 798	.003 504	.027 811	7.936 233	.126 004
32	40.361 118	321.315 250	.003 112	.024 776	7.961 010	.125 612
33	45.305 355	361.676 369	.002 765	.022 072	7.983 082	.125 265
34	50.855 261	406.981 724	.002 457	.019 664	8.002 746	.124 957
35	57.085 031	457.836 985	.002 184	.017 518	8.020 263	.124 684
36	64.077 947	514.922 016	.001 942	.015 606	8.035 869	.124 442
37	71.927 495	578.999 963	.001 727	.013 903	8.049 772	.124 227
38	80.738 614	650.927 458	.001 536	.012 386	8.062 158	.124 036
39	90.629 094	731.666 072	.001 367	.011 034	8.073 192	.123 867
40	101.731 158	822.295 165	.001 216	.009 830	8.083 022	.123 716
41	114.193 225	924.026 323	.001 082	.008 757	8.091 779	.123 582
42	128.181 895	1038.219 548	.000 963	.007 801	8.099 580	.123 463
43	143.884 177	1166.401 442	.000 857	.006 950	8.106 530	.123 357
44	161.509 988	1310.285 619	.000 763	.006 192	8.112 722	.123 263
45	181.294 962	1471.795 607	.000 679	.005 516	8.118 238	.123 179
46	203.503 595	1653.090 569	.000 605	.004 914	8.123 152	.123 105
47	228.432 785	1856.594 164	.000 539	.004 378	8.127 529	.123 039
48	256.415 801	2085.026 949	.000 480	.003 900	8.131 429	.122 980
49	287.826 737	2341.442 750	.000 427	.003 474	8.134 904	.122 927
50	323.085 512	2629.269 487	.000 380	.003 095	8.137 999	.122 880
51	362.663 487	2952.354 999	.000 339	.002 757	8.140 756	.122 839
52	407.089 765	3315.018 487	.000 302	.002 456	8.143 213	.122 802
53	456.958 261	3722.108 251	.000 269	.002 188	8.145 401	.122 769
54	512.935 648	4179.066 512	.000 239	.001 950	8.147 351	.122 739
55	575.770 265	4692.002 160	.000 213	.001 737	8.149 087	.122 713
56	646.302 122	5267.772 424	.000 190	.001 547	8.150 635	.122 690
57	725.474 132	5914.074 546	.000 169	.001 378	8.152 013	.122 669
58	814.344 713	6639.548 678	.000 151	.001 228	8.153 241	.122 651
59	914.101 940	7453.893 391	.000 134	.001 094	8.154 335	.122 634
60	1026.079 428	8367.995 332	.000 120	.000 975	8.155 310	.122 620
	$S^n = (1+i)^n$	$S_{\overline{n}|} = \frac{S^n - 1}{i}$	$1/S_{\overline{n}|} = \frac{i}{S^n - 1}$	$V^n = \frac{1}{S^n}$	$A_{\overline{n}|} = \frac{1 - 1/S^n}{i}$	$\frac{1}{A_{\overline{n}|}} = \frac{i}{1 - 1/S^n}$

YEARS	1 AMOUNT OF ONE	2 AMOUNT OF ONE PER PERIOD	3 SINKING FUND FACTOR	4 PRESENT WORTH OF ONE	5 PRESENT WORTH ONE PER PERIOD	6 PARTIAL PAYMENT
1	1.125 000	1.000 000	1.000 000	.888 889	.888 889	1.125 000
2	1.265 625	2.125 000	.470 588	.790 123	1.679 012	.595 588
3	1.423 828	3.390 625	.294 931	.702 332	2.381 344	.419 931
4	1.601 807	4.814 453	.207 708	.624 295	3.005 639	.332 708
5	1.802 032	6.416 260	.155 854	.554 929	3.560 568	.280 854
6	2.027 287	8.218 292	.121 680	.493 270	4.053 839	.246 680
7	2.280 697	10.245 579	.097 603	.438 462	4.492 301	.222 603
8	2.565 785	12.526 276	.079 832	.389 744	4.882 045	.204 832
9	2.886 508	15.092 061	.066 260	.346 439	5.228 485	.191 260
10	3.247 321	17.978 568	.055 622	.307 946	5.536 431	.180 622
11	3.653 236	21.225 889	.047 112	.273 730	5.810 161	.172 112
12	4.109 891	24.879 125	.040 194	.243 315	6.053 476	.165 194
13	4.623 627	28.989 016	.034 496	.216 280	6.269 757	.159 496
14	5.201 580	33.612 643	.029 751	.192 249	6.462 006	.154 751
15	5.851 778	38.814 223	.025 764	.170 888	6.632 894	.150 764
16	6.583 250	44.666 001	.022 388	.151 901	6.784 795	.147 388
17	7.406 156	51.249 252	.019 512	.135 023	6.919 818	.144 512
18	8.331 926	58.655 408	.017 049	.120 020	7.039 838	.142 049
19	9.373 417	66.987 334	.014 928	.106 685	7.146 523	.139 928
20	10.545 094	76.360 751	.013 096	.094 831	7.241 353	.138 096
21	11.863 231	86.905 845	.011 507	.084 294	7.325 647	.136 507
22	13.346 134	98.769 075	.010 125	.074 928	7.400 575	.135 125
23	15.014 401	112.115 210	.008 919	.066 603	7.467 178	.133 919
24	16.891 201	127.129 611	.007 866	.059 202	7.526 381	.132 866
25	19.002 602	144.020 812	.006 943	.052 624	7.579 005	.131 943
26	21.377 927	163.023 414	.006 134	.046 777	7.625 782	.131 134
27	24.050 168	184.401 340	.005 423	.041 580	7.667 362	.130 423
28	27.056 438	208.451 508	.004 797	.036 960	7.704 322	.129 797
29	30.438 493	235.507 946	.004 246	.032 853	7.737 175	.129 246
30	34.243 305	265.946 440	.003 760	.029 203	7.766 378	.128 760
31	38.523 718	300.189 745	.003 331	.025 958	7.792 336	.128 331
32	43.339 183	338.713 463	.002 952	.023 074	7.815 410	.127 952
33	48.756 581	382.052 645	.002 617	.020 510	7.835 920	.127 617
34	54.851 153	430.809 226	.002 321	.018 231	7.854 151	.127 321
35	61.707 547	485.660 379	.002 059	.016 205	7.870 356	.127 059
36	69.420 991	547.367 927	.001 827	.014 405	7.884 761	.126 827
37	78.098 615	616.788 918	.001 621	.012 804	7.897 565	.126 621
38	87.860 942	694.887 532	.001 439	.011 382	7.908 947	.126 439
39	98.843 559	782.748 474	.001 278	.010 117	7.919 064	.126 278
40	111.199 004	881.592 033	.001 134	.008 993	7.928 057	.126 134
41	125.098 880	992.791 037	.001 007	.007 994	7.936 051	.126 007
42	140.736 240	1117.889 917	.000 895	.007 105	7.943 156	.125 895
43	158.328 270	1258.626 157	.000 795	.006 316	7.949 472	.125 795
44	178.119 303	1416.954 426	.000 706	.005 614	7.955 086	.125 706
45	200.384 216	1595.073 729	.000 627	.004 990	7.960 077	.125 627
46	225.432 243	1795.457 946	.000 557	.004 436	7.964 513	.125 557
47	253.611 274	2020.890 189	.000 495	.003 943	7.968 456	.125 495
48	285.312 683	2274.501 462	.000 440	.003 505	7.971 961	.125 440
49	320.976 768	2559.814 145	.000 391	.003 115	7.975 076	.125 391
50	361.098 864	2880.790 913	.000 347	.002 769	7.977 845	.125 347
51	406.236 222	3241.889 778	.000 308	.002 462	7.980 307	.125 308
52	457.015 750	3648.126 000	.000 274	.002 188	7.982 495	.125 274
53	514.142 719	4105.141 750	.000 244	.001 945	7.984 440	.125 244
54	578.410 559	4619.284 468	.000 216	.001 729	7.986 169	.125 216
55	650.711 878	5197.695 027	.000 192	.001 537	7.987 706	.125 192
56	732.050 863	5848.406 905	.000 171	.001 366	7.989 072	.125 171
57	823.557 221	6580.457 769	.000 152	.001 214	7.990 286	.125 152
58	926.501 874	7404.014 990	.000 135	.001 079	7.991 365	.125 135
59	1042.314 608	8330.516 863	.000 120	.000 959	7.992 325	.125 120
60	1172.603 934	9372.831 471	.000 107	.000 853	7.993 178	.125 107
	$S^n = (1+i)^n$	$S_{\overline{n}|} = \frac{S^n - 1}{i}$	$1/S_{\overline{n}|} = \frac{i}{S^n - 1}$	$V^n = \frac{1}{S^n}$	$A_{\overline{n}|} = \frac{1 - 1/S^n}{i}$	$\frac{1}{A_{\overline{n}|}} = \frac{i}{1 - 1/S^n}$

12¾% ANNUAL TABLE 12¾%

YEARS	1 AMOUNT OF ONE	2 AMOUNT OF ONE PER PERIOD	3 SINKING FUND FACTOR	4 PRESENT WORTH OF ONE	5 PRESENT WORTH ONE PER PERIOD	6 PARTIAL PAYMENT
1	1.127 500	1.000 000	1.000 000	.886 918	.886 918	1.127 500
2	1.271 256	2.127 500	.470 035	.786 623	1.673 541	.597 535
3	1.433 341	3.398 756	.294 225	.697 670	2.371 212	.421 725
4	1.616 092	4.832 098	.206 949	.618 776	2.989 988	.334 449
5	1.822 144	6.448 190	.155 082	.548 804	3.538 792	.282 582
6	2.054 468	8.270 334	.120 914	.486 744	4.025 536	.248 414
7	2.316 412	10.324 802	.096 854	.431 702	4.457 239	.224 354
8	2.611 755	12.641 214	.079 106	.382 884	4.840 123	.206 606
9	2.944 754	15.252 969	.065 561	.339 587	5.179 710	.193 061
10	3.320 210	18.197 723	.054 952	.301 186	5.480 896	.182 452
11	3.743 536	21.517 932	.046 473	.267 127	5.748 023	.173 973
12	4.220 837	25.261 469	.039 586	.236 920	5.984 943	.167 086
13	4.758 994	29.482 306	.033 919	.210 128	6.195 071	.161 419
14	5.365 766	34.241 300	.029 204	.186 367	6.381 438	.156 704
15	6.049 901	39.607 066	.025 248	.165 292	6.546 730	.152 748
16	6.821 263	45.656 966	.021 902	.146 600	6.693 330	.149 402
17	7.690 974	52.478 230	.019 056	.130 023	6.823 353	.146 556
18	8.671 574	60.169 204	.016 620	.115 319	6.938 672	.144 120
19	9.777 199	68.840 777	.014 526	.102 279	7.040 951	.142 026
20	11.023 792	78.617 977	.012 720	.090 713	7.131 664	.140 220
21	12.429 326	89.641 769	.011 156	.080 455	7.212 119	.138 656
22	14.014 065	102.071 094	.009 797	.071 357	7.283 475	.137 297
23	15.800 858	116.085 159	.008 614	.063 288	7.346 763	.136 114
24	17.815 467	131.886 016	.007 582	.056 131	7.402 894	.135 082
25	20.086 939	149.701 483	.006 680	.049 784	7.452 678	.134 180
26	22.648 024	169.788 423	.005 890	.044 154	7.496 832	.133 390
27	25.535 647	192.436 446	.005 197	.039 161	7.535 993	.132 697
28	28.791 442	217.972 093	.004 588	.034 733	7.570 725	.132 088
29	32.462 351	246.763 535	.004 052	.030 805	7.601 530	.131 552
30	36.601 300	279.225 886	.003 581	.027 321	7.628 852	.131 081
31	41.267 966	315.827 187	.003 166	.024 232	7.653 083	.130 666
32	46.529 632	357.095 153	.002 800	.021 492	7.674 575	.130 300
33	52.462 160	403.624 785	.002 478	.019 061	7.693 636	.129 978
34	59.151 085	456.086 945	.002 193	.016 906	7.710 542	.129 693
35	66.692 849	515.238 030	.001 941	.014 994	7.725 536	.129 441
36	75.196 187	581.930 879	.001 718	.013 299	7.738 835	.129 218
37	84.783 701	657.127 066	.001 522	.011 795	7.750 630	.129 022
38	95.593 623	741.910 767	.001 348	.010 461	7.761 091	.128 848
39	107.781 810	837.504 390	.001 194	.009 278	7.770 369	.128 694
40	121.523 990	945.286 200	.001 058	.008 229	7.778 597	.128 558
41	137.018 299	1066.810 190	.000 937	.007 298	7.785 896	.128 437
42	154.488 132	1203.828 490	.000 831	.006 473	7.792 369	.128 331
43	174.185 369	1358.316 622	.000 736	.005 741	7.798 110	.128 236
44	196.394 004	1532.501 991	.000 653	.005 092	7.803 202	.128 153
45	221.434 239	1728.895 995	.000 578	.004 516	7.807 718	.128 078
46	249.667 105	1950.330 235	.000 513	.004 005	7.811 723	.128 013
47	281.499 661	2199.997 339	.000 455	.003 552	7.815 275	.127 955
48	317.390 868	2481.497 000	.000 403	.003 151	7.818 426	.127 903
49	357.858 203	2798.887 868	.000 357	.002 794	7.821 220	.127 857
50	403.485 124	3156.746 071	.000 317	.002 478	7.823 699	.127 817
51	454.929 477	3560.231 195	.000 281	.002 198	7.825 897	.127 781
52	512.932 986	4015.160 672	.000 249	.001 950	7.827 846	.127 749
53	578.331 941	4528.093 658	.000 221	.001 729	7.829 576	.127 721
54	652.069 264	5106.425 599	.000 196	.001 534	7.831 109	.127 696
55	735.208 095	5758.494 863	.000 174	.001 360	7.832 469	.127 674
56	828.947 127	6493.702 959	.000 154	.001 206	7.833 676	.127 654
57	934.637 886	7322.650 086	.000 137	.001 070	7.834 746	.127 637
58	1053.804 216	8257.287 972	.000 121	.000 949	7.835 695	.127 621
59	1188.164 254	9311.092 188	.000 107	.000 842	7.836 536	.127 607
60	1339.655 196	10499.256 442	.000 095	.000 746	7.837 283	.127 595
	$S^n = (1+i)^n$	$S_{\overline{n}|} = \frac{S^n - 1}{i}$	$1/S_{\overline{n}|} = \frac{i}{S^n - 1}$	$V^n = \frac{1}{S^n}$	$A_{\overline{n}|} = \frac{1 - 1/S^n}{i}$	$\frac{1}{A_{\overline{n}|}} = \frac{i}{1 - 1/S^n}$

YEARS	1 AMOUNT OF ONE	2 AMOUNT OF ONE PER PERIOD	3 SINKING FUND FACTOR	4 PRESENT WORTH OF ONE	5 PRESENT WORTH ONE PER PERIOD	6 PARTIAL PAYMENT
1	1.130 000	1.000 000	1.000 000	.884 956	.884 956	1.130 000
2	1.276 900	2.130 000	.469 484	.783 147	1.668 102	.599 484
3	1.442 897	3.406 900	.293 522	.693 050	2.361 153	.423 522
4	1.630 474	4.849 797	.206 194	.613 319	2.974 471	.336 194
5	1.842 435	6.480 271	.154 315	.542 760	3.517 231	.284 315
6	2.081 952	8.322 706	.120 153	.480 319	3.997 550	.250 153
7	2.352 605	10.404 658	.096 111	.425 061	4.422 610	.226 111
8	2.658 444	12.757 263	.078 387	.376 160	4.798 770	.208 387
9	3.004 042	15.415 707	.064 869	.332 885	5.131 655	.194 869
10	3.394 567	18.419 749	.054 290	.294 588	5.426 243	.184 290
11	3.835 861	21.814 317	.045 841	.260 698	5.686 941	.175 841
12	4.334 523	25.650 178	.038 986	.230 706	5.917 647	.168 986
13	4.898 011	29.984 701	.033 350	.204 165	6.121 812	.163 350
14	5.534 753	34.882 712	.028 667	.180 677	6.302 488	.158 667
15	6.254 270	40.417 464	.024 742	.159 891	6.462 379	.154 742
16	7.067 326	46.671 735	.021 426	.141 496	6.603 875	.151 426
17	7.986 078	53.739 060	.018 608	.125 218	6.729 093	.148 608
18	9.024 268	61.725 138	.016 201	.110 812	6.839 905	.146 201
19	10.197 423	70.749 406	.014 134	.098 064	6.937 969	.144 134
20	11.523 088	80.946 829	.012 354	.086 782	7.024 752	.142 354
21	13.021 089	92.469 917	.010 814	.076 798	7.101 550	.140 814
22	14.713 831	105.491 006	.009 479	.067 963	7.169 513	.139 479
23	16.626 629	120.204 837	.008 319	.060 144	7.229 658	.138 319
24	18.788 091	136.831 465	.007 308	.053 225	7.282 883	.137 308
25	21.230 542	155.619 556	.006 426	.047 102	7.329 985	.136 426
26	23.990 513	176.850 098	.005 655	.041 683	7.371 668	.135 655
27	27.109 279	200.840 611	.004 979	.036 888	7.408 556	.134 979
28	30.633 486	227.949 890	.004 387	.032 644	7.441 200	.134 387
29	34.615 839	258.583 376	.003 867	.028 889	7.470 088	.133 867
30	39.115 898	293.199 215	.003 411	.025 565	7.495 653	.133 411
31	44.200 965	332.315 113	.003 009	.022 624	7.518 277	.133 009
32	49.947 090	376.516 078	.002 656	.020 021	7.538 299	.132 656
33	56.440 212	426.463 168	.002 345	.017 718	7.556 016	.132 345
34	63.777 439	482.903 380	.002 071	.015 680	7.571 696	.132 071
35	72.068 506	546.680 819	.001 829	.013 876	7.585 572	.131 829
36	81.437 412	618.749 325	.001 616	.012 279	7.597 851	.131 616
37	92.024 276	700.186 738	.001 428	.010 867	7.608 718	.131 428
38	103.987 432	792.211 014	.001 262	.009 617	7.618 334	.131 262
39	117.505 798	896.198 445	.001 116	.008 510	7.626 844	.131 116
40	132.781 552	1013.704 243	.000 986	.007 531	7.634 376	.130 986
41	150.043 153	1146.485 795	.000 872	.006 665	7.641 040	.130 872
42	169.548 763	1296.528 948	.000 771	.005 898	7.646 938	.130 771
43	191.590 103	1466.077 712	.000 682	.005 219	7.652 158	.130 682
44	216.496 816	1657.667 814	.000 603	.004 619	7.656 777	.130 603
45	244.641 402	1874.164 630	.000 534	.004 088	7.660 864	.130 534
46	276.444 784	2118.806 032	.000 472	.003 617	7.664 482	.130 472
47	312.382 606	2395.250 816	.000 417	.003 201	7.667 683	.130 417
48	352.992 345	2707.633 422	.000 369	.002 833	7.670 516	.130 369
49	398.881 350	3060.625 767	.000 327	.002 507	7.673 023	.130 327
50	450.735 925	3459.507 117	.000 289	.002 219	7.675 242	.130 289
51	509.331 595	3910.243 042	.000 256	.001 963	7.677 205	.130 256
52	575.544 703	4419.574 637	.000 226	.001 737	7.678 942	.130 226
53	650.365 514	4995.119 340	.000 200	.001 538	7.680 480	.130 200
54	734.913 031	5645.484 854	.000 177	.001 361	7.681 841	.130 177
55	830.451 725	6380.397 885	.000 157	.001 204	7.683 045	.130 157
56	938.410 449	7210.849 610	.000 139	.001 066	7.684 111	.130 139
57	1060.403 808	8149.260 060	.000 123	.000 943	7.685 054	.130 123
58	1198.256 303	9209.663 867	.000 109	.000 835	7.685 888	.130 109
59	1354.029 622	10407.920 170	.000 096	.000 739	7.686 627	.130 096
60	1530.053 473	11761.949 792	.000 085	.000 654	7.687 280	.130 085
	$S^n = (1+i)^n$	$S_{\overline{n}|} = \frac{S^n - 1}{i}$	$1/S_{\overline{n}|} = \frac{i}{S^n - 1}$	$V^n = \frac{1}{S^n}$	$A_{\overline{n}|} = \frac{1 - 1/S^n}{i}$	$\frac{1}{A_{\overline{n}|}} = \frac{i}{1 - 1/S^n}$

	1	2	3	4	5	6
YEARS	AMOUNT OF ONE	AMOUNT OF ONE PER PERIOD	SINKING FUND FACTOR	PRESENT WORTH OF ONE	PRESENT WORTH ONE PER PERIOD	PARTIAL PAYMENT
1	1.140 000	1.000 000	1.000 000	.877 193	.877 193	1.140 000
2	1.299 600	2.140 000	.467 290	.769 468	1.646 661	.607 290
3	1.481 544	3.439 600	.290 731	.674 972	2.321 632	.430 731
4	1.688 960	4.921 144	.203 205	.592 080	2.913 712	.343 205
5	1.925 415	6.610 104	.151 284	.519 369	3.433 081	.291 284
6	2.194 973	8.535 519	.117 157	.455 587	3.888 668	.257 157
7	2.502 269	10.730 491	.093 192	.399 637	4.288 305	.233 192
8	2.852 586	13.232 760	.075 570	.350 559	4.638 864	.215 570
9	3.251 949	16.085 347	.062 168	.307 508	4.946 372	.202 168
10	3.707 221	19.337 295	.051 714	.269 744	5.216 116	.191 714
11	4.226 232	23.044 516	.043 394	.236 617	5.452 733	.183 394
12	4.817 905	27.270 749	.036 669	.207 559	5.660 292	.176 669
13	5.492 411	32.088 654	.031 164	.182 069	5.842 362	.171 164
14	6.261 349	37.581 065	.026 609	.159 710	6.002 072	.166 609
15	7.137 938	43.842 414	.022 809	.140 096	6.142 168	.162 809
16	8.137 249	50.980 352	.019 615	.122 892	6.265 060	.159 615
17	9.276 464	59.117 601	.016 915	.107 800	6.372 859	.156 915
18	10.575 169	68.394 066	.014 621	.094 561	6.467 420	.154 621
19	12.055 693	78.969 235	.012 663	.082 948	6.550 369	.152 663
20	13.743 490	91.024 928	.010 986	.072 762	6.623 131	.150 986
21	15.667 578	104.768 418	.009 545	.063 826	6.686 957	.149 545
22	17.861 039	120.435 996	.008 303	.055 988	6.742 944	.148 303
23	20.361 585	138.297 035	.007 231	.049 112	6.792 056	.147 231
24	23.212 207	158.658 620	.006 303	.043 081	6.835 137	.146 303
25	26.461 916	181.870 827	.005 498	.037 790	6.872 927	.145 498
26	30.166 584	208.332 743	.004 800	.033 149	6.906 077	.144 800
27	34.389 906	238.499 327	.004 193	.029 078	6.935 155	.144 193
28	39.204 493	272.889 233	.003 664	.025 507	6.960 662	.143 664
29	44.693 122	312.093 725	.003 204	.022 375	6.983 037	.143 204
30	50.950 159	356.786 847	.002 803	.019 627	7.002 664	.142 803
31	58.083 181	407.737 006	.002 453	.017 217	7.019 881	.142 453
32	66.214 826	465.820 186	.002 147	.015 102	7.034 983	.142 147
33	75.484 902	532.035 012	.001 880	.013 248	7.048 231	.141 880
34	86.052 788	607.519 914	.001 646	.011 621	7.059 852	.141 646
35	98.100 178	693.572 702	.001 442	.010 194	7.070 045	.141 442
36	111.834 203	791.672 881	.001 263	.008 942	7.078 987	.141 263
37	127.490 992	903.507 084	.001 107	.007 844	7.086 831	.141 107
38	145.339 731	1030.998 076	.000 970	.006 880	7.093 711	.140 970
39	165.687 293	1176.337 806	.000 850	.006 035	7.099 747	.140 850
40	188.883 514	1342.025 099	.000 745	.005 294	7.105 041	.140 745
41	215.327 206	1530.908 613	.000 653	.004 644	7.109 685	.140 653
42	245.473 015	1746.235 819	.000 573	.004 074	7.113 759	.140 573
43	279.839 237	1991.708 833	.000 502	.003 573	7.117 332	.140 502
44	319.016 730	2271.548 070	.000 440	.003 135	7.120 467	.140 440
45	363.679 072	2590.564 800	.000 386	.002 750	7.123 217	.140 386
46	414.594 142	2954.243 872	.000 338	.002 412	7.125 629	.140 338
47	472.637 322	3368.838 014	.000 297	.002 116	7.127 744	.140 297
48	538.806 547	3841.475 336	.000 260	.001 856	7.129 600	.140 260
49	614.239 464	4380.281 883	.000 228	.001 628	7.131 228	.140 228
50	700.232 988	4994.521 346	.000 200	.001 428	7.132 656	.140 200
51	798.265 607	5694.754 335	.000 176	.001 253	7.133 909	.140 176
52	910.022 792	6493.019 941	.000 154	.001 099	7.135 008	.140 154
53	1037.425 983	7403.042 733	.000 135	.000 964	7.135 972	.140 135
54	1182.665 620	8440.468 716	.000 118	.000 846	7.136 818	.140 118
55	1348.238 807	9623.134 336	.000 104	.000 742	7.137 559	.140 104
56	1536.992 240	10971.373 143	.000 091	.000 651	7.138 210	.140 091
57	1752.171 154	12508.365 383	.000 080	.000 571	7.138 781	.140 080
58	1997.475 115	14260.536 537	.000 070	.000 501	7.139 281	.140 070
59	2277.121 631	16258.011 652	.000 062	.000 439	7.139 720	.140 062
60	2595.918 660	18535.133 283	.000 054	.000 385	7.140 106	.140 054
	$S^n = (1+i)^n$	$S_{\overline{n}|} = \frac{S^n - 1}{i}$	$1/S_{\overline{n}|} = \frac{i}{S^n - 1}$	$V^n = \frac{1}{S^n}$	$A_{\overline{n}|} = \frac{1 - 1/S^n}{i}$	$\frac{1}{A_{\overline{n}|}} = \frac{i}{1 - 1/S^n}$

YEARS	1 AMOUNT OF ONE	2 AMOUNT OF ONE PER PERIOD	3 SINKING FUND FACTOR	4 PRESENT WORTH OF ONE	5 PRESENT WORTH ONE PER PERIOD	6 PARTIAL PAYMENT
1	1.150 000	1.000 000	1.000 000	.869 565	.869 565	1.150 000
2	1.322 500	2.150 000	.465 116	.756 144	1.625 709	.615 116
3	1.520 875	3.472 500	.287 977	.657 516	2.283 225	.437 977
4	1.749 006	4.993 375	.200 265	.571 753	2.854 978	.350 265
5	2.011 357	6.742 381	.148 316	.497 177	3.352 155	.298 316
6	2.313 061	8.753 738	.114 237	.432 328	3.784 483	.264 237
7	2.660 020	11.066 799	.090 360	.375 937	4.160 420	.240 360
8	3.059 023	13.726 819	.072 850	.326 902	4.487 322	.222 850
9	3.517 876	16.785 842	.059 574	.284 262	4.771 584	.209 574
10	4.045 558	20.303 718	.049 252	.247 185	5.018 769	.199 252
11	4.652 391	24.349 276	.041 069	.214 943	5.233 712	.191 069
12	5.350 250	29.001 667	.034 481	.186 907	5.420 619	.184 481
13	6.152 788	34.351 917	.029 110	.162 528	5.583 147	.179 110
14	7.075 706	40.504 705	.024 688	.141 329	5.724 476	.174 688
15	8.137 062	47.580 411	.021 017	.122 894	5.847 370	.171 017
16	9.357 621	55.717 472	.017 948	.106 865	5.954 235	.167 948
17	10.761 264	65.075 093	.015 367	.092 926	6.047 161	.165 367
18	12.375 454	75.836 357	.013 186	.080 805	6.127 966	.163 186
19	14.231 772	88.211 811	.011 336	.070 265	6.198 231	.161 336
20	16.366 537	102.443 583	.009 761	.061 100	6.259 331	.159 761
21	18.821 518	118.810 120	.008 417	.053 131	6.312 462	.158 417
22	21.644 746	137.631 638	.007 266	.046 201	6.358 663	.157 266
23	24.891 458	159.276 384	.006 278	.040 174	6.398 837	.156 278
24	28.625 176	184.167 841	.005 430	.034 934	6.433 771	.155 430
25	32.918 953	212.793 017	.004 699	.030 378	6.464 149	.154 699
26	37.856 796	245.711 970	.004 070	.026 415	6.490 564	.154 070
27	43.535 315	283.568 766	.003 526	.022 970	6.513 534	.153 526
28	50.065 612	327.104 080	.003 057	.019 974	6.533 508	.153 057
29	57.575 454	377.169 693	.002 651	.017 369	6.550 877	.152 651
30	66.211 772	434.745 146	.002 300	.015 103	6.565 980	.152 300
31	76.143 538	500.956 918	.001 996	.013 133	6.579 113	.151 996
32	87.565 068	577.100 456	.001 733	.011 420	6.590 533	.151 733
33	100.699 829	664.665 524	.001 505	.009 931	6.600 463	.151 505
34	115.804 803	765.365 353	.001 307	.008 635	6.609 099	.151 307
35	133.175 523	881.170 156	.001 135	.007 509	6.616 607	.151 135
36	153.151 852	1014.345 680	.000 986	.006 529	6.623 137	.150 986
37	176.124 630	1167.497 532	.000 857	.005 678	6.628 815	.150 857
38	202.543 324	1343.622 161	.000 744	.004 937	6.633 752	.150 744
39	232.924 823	1546.165 485	.000 647	.004 293	6.638 045	.150 647
40	267.863 546	1779.090 308	.000 562	.003 733	6.641 778	.150 562
41	308.043 078	2046.953 854	.000 489	.003 246	6.645 025	.150 489
42	354.249 540	2354.996 933	.000 425	.002 823	6.647 848	.150 425
43	407.386 971	2709.246 473	.000 369	.002 455	6.650 302	.150 369
44	468.495 017	3116.633 443	.000 321	.002 134	6.652 437	.150 321
45	538.769 269	3585.128 460	.000 279	.001 856	6.654 293	.150 279
46	619.584 659	4123.897 729	.000 242	.001 614	6.655 907	.150 242
47	712.522 358	4743.482 388	.000 211	.001 403	6.657 310	.150 211
48	819.400 712	5456.004 746	.000 183	.001 220	6.658 531	.150 183
49	942.310 819	6275.405 458	.000 159	.001 061	6.659 592	.150 159
50	1083.657 442	7217.716 277	.000 139	.000 923	6.660 515	.150 139
51	1246.206 058	8301.373 719	.000 120	.000 802	6.661 317	.150 120
52	1433.136 966	9547.579 777	.000 105	.000 698	6.662 015	.150 105
53	1648.107 511	10980.716 743	.000 091	.000 607	6.662 622	.150 091
54	1895.323 638	12628.824 255	.000 079	.000 528	6.663 149	.150 079
55	2179.622 184	14524.147 893	.000 069	.000 459	6.663 608	.150 069
56	2506.565 512	16703.770 077	.000 060	.000 399	6.664 007	.150 060
57	2882.550 338	19210.335 588	.000 052	.000 347	6.664 354	.150 052
58	3314.932 889	22092.885 926	.000 045	.000 302	6.664 656	.150 045
59	3812.172 822	25407.818 815	.000 039	.000 262	6.664 918	.150 039
60	4383.998 746	29219.991 638	.000 034	.000 228	6.665 146	.150 034
	$S^n = (1+i)^n$	$S_{\overline{n}\rceil} = \frac{S^n - 1}{i}$	$1/S_{\overline{n}\rceil} = \frac{i}{S^n - 1}$	$V^n = \frac{1}{S^n}$	$A_{\overline{n}\rceil} = \frac{1 - 1/S^n}{i}$	$\frac{1}{A_{\overline{n}\rceil}} = \frac{i}{1 - 1/S^n}$

YEARS	1 AMOUNT OF ONE	2 AMOUNT OF ONE PER PERIOD	3 SINKING FUND FACTOR	4 PRESENT WORTH OF ONE	5 PRESENT WORTH ONE PER PERIOD	6 PARTIAL PAYMENT
1	1.160 000	1.000 000	1.000 000	.862 069	.862 069	1.160 000
2	1.345 600	2.160 000	.462 963	.743 163	1.605 232	.622 963
3	1.560 896	3.505 600	.285 258	.640 658	2.245 890	.445 258
4	1.810 639	5.066 496	.197 375	.552 291	2.798 181	.357 375
5	2.100 342	6.877 135	.145 409	.476 113	3.274 294	.305 409
6	2.436 396	8.977 477	.111 390	.410 442	3.684 736	.271 390
7	2.826 220	11.413 873	.087 613	.353 830	4.038 565	.247 613
8	3.278 415	14.240 093	.070 224	.305 025	4.343 591	.230 224
9	3.802 961	17.518 508	.057 082	.262 953	4.606 544	.217 082
10	4.411 435	21.321 469	.046 901	.226 684	4.833 227	.206 901
11	5.117 265	25.732 904	.038 861	.195 417	5.028 644	.198 861
12	5.936 027	30.850 169	.032 415	.168 463	5.197 107	.192 415
13	6.885 791	36.786 196	.027 184	.145 227	5.342 334	.187 184
14	7.987 518	43.671 987	.022 898	.125 195	5.467 529	.182 898
15	9.265 521	51.659 505	.019 358	.107 927	5.575 456	.179 358
16	10.748 004	60.925 026	.016 414	.093 041	5.668 497	.176 414
17	12.467 685	71.673 030	.013 952	.080 207	5.748 704	.173 952
18	14.462 514	84.140 715	.011 885	.069 144	5.817 848	.171 885
19	16.776 517	98.603 230	.010 142	.059 607	5.877 455	.170 142
20	19.460 759	115.379 747	.008 667	.051 385	5.928 841	.168 667
21	22.574 481	134.840 506	.007 416	.044 298	5.973 139	.167 416
22	26.186 398	157.414 987	.006 353	.038 188	6.011 326	.166 353
23	30.376 222	183.601 385	.005 447	.032 920	6.044 247	.165 447
24	35.236 417	213.977 607	.004 673	.028 380	6.072 627	.164 673
25	40.874 244	249.214 024	.004 013	.024 465	6.097 092	.164 013
26	47.414 123	290.088 267	.003 447	.021 091	6.118 183	.163 447
27	55.000 382	337.502 390	.002 963	.018 182	6.136 364	.162 963
28	63.800 444	392.502 773	.002 548	.015 674	6.152 038	.162 548
29	74.008 515	456.303 216	.002 192	.013 512	6.165 550	.162 192
30	85.849 877	530.311 731	.001 886	.011 648	6.177 198	.161 886
31	99.585 857	616.161 608	.001 623	.010 042	6.187 240	.161 623
32	115.519 594	715.747 465	.001 397	.008 657	6.195 897	.161 397
33	134.002 729	831.267 059	.001 203	.007 463	6.203 359	.161 203
34	155.443 166	965.269 789	.001 036	.006 433	6.209 792	.161 036
35	180.314 073	1120.712 955	.000 892	.005 546	6.215 338	.160 892
36	209.164 324	1301.027 028	.000 769	.004 781	6.220 119	.160 769
37	242.630 616	1510.191 352	.000 662	.004 121	6.224 241	.160 662
38	281.451 515	1752.821 968	.000 571	.003 553	6.227 794	.160 571
39	326.483 757	2034.273 483	.000 492	.003 063	6.230 857	.160 492
40	378.721 158	2360.757 241	.000 424	.002 640	6.233 497	.160 424
41	439.316 544	2739.478 399	.000 365	.002 276	6.235 773	.160 365
42	509.607 191	3178.794 943	.000 315	.001 962	6.237 736	.160 315
43	591.144 341	3688.402 134	.000 271	.001 692	6.239 427	.160 271
44	685.727 436	4279.546 475	.000 234	.001 458	6.240 886	.160 234
45	795.443 826	4965.273 911	.000 201	.001 257	6.242 143	.160 201
46	922.714 838	5760.717 737	.000 174	.001 084	6.243 227	.160 174
47	1070.349 212	6683.432 575	.000 150	.000 934	6.244 161	.160 150
48	1241.605 086	7753.781 787	.000 129	.000 805	6.244 966	.160 129
49	1440.261 900	8995.386 873	.000 111	.000 694	6.245 661.	.160 111
50	1670.703 804	10435.648 773	.000 096	.000 599	6.246 259	.160 096
51	1938.016 412	12106.352 576	.000 083	.000 516	6.246 775	.160 083
52	2248.099 038	14044.368 988	.000 071	.000 445	6.247 220	.160 071
53	2607.794 884	16292.468 026	.000 061	.000 383	6.247 603	.160 061
54	3025.042 066	18900.262 911	.000 053	.000 331	6.247 934	.160 053
55	3509.048 796	21925.304 976	.000 046	.000 285	6.248 219	.160 046
56	4070.496 604	25434.353 773	.000 039	.000 246	6.248 465	.160 039
57	4721.776 060	29504.850 376	.000 034	.000 212	6.248 676	.160 034
58	5477.260 230	34226.626 436	.000 029	.000 183	6.248 859	.160 029
59	6353.621 867	39703.886 666	.000 025	.000 157	6.249 016	.160 025
60	7370.201 365	46057.508 533	.000 022	.000 136	6.249 152	.160 022
	$S^n = (1+i)^n$	$S_{\overline{n}|} = \frac{S^n - 1}{i}$	$1/S_{\overline{n}|} = \frac{i}{S^n - 1}$	$V^n = \frac{1}{S^n}$	$A_{\overline{n}|} = \frac{1 - 1/S^n}{i}$	$\frac{1}{A_{\overline{n}|}} = \frac{i}{1 - 1/S^n}$

YEARS	1 AMOUNT OF ONE	2 AMOUNT OF ONE PER PERIOD	3 SINKING FUND FACTOR	4 PRESENT WORTH OF ONE	5 PRESENT WORTH ONE PER PERIOD	6 PARTIAL PAYMENT
1	1.170 000	1.000 000	1.000 000	.854 701	.854 701	1.170 000
2	1.368 900	2.170 000	.460 829	.730 514	1.585 214	.630 829
3	1.601 613	3.538 900	.282 574	.624 371	2.209 585	.452 574
4	1.873 887	5.140 513	.194 533	.533 650	2.743 235	.364 533
5	2.192 448	7.014 400	.142 564	.456 111	3.199 346	.312 564
6	2.565 164	9.206 848	.108 615	.389 839	3.589 185	.278 615
7	3.001 242	11.772 012	.084 947	.333 195	3.922 380	.254 947
8	3.511 453	14.773 255	.067 690	.284 782	4.207 163	.237 690
9	4.108 400	18.284 708	.054 691	.243 404	4.450 566	.224 691
10	4.806 828	22.393 108	.044 657	.208 037	4.658 604	.214 657
11	5.623 989	27.199 937	.036 765	.177 810	4.836 413	.206 765
12	6.580 067	32.823 926	.030 466	.151 974	4.988 387	.200 466
13	7.698 679	39.403 993	.025 378	.129 892	5.118 280	.195 378
14	9.007 454	47.102 672	.021 230	.111 019	5.229 299	.191 230
15	10.538 721	56.110 126	.017 822	.094 888	5.324 187	.187 822
16	12.330 304	66.648 848	.015 004	.081 101	5.405 288	.185 004
17	14.426 456	78.979 152	.012 662	.069 317	5.474 605	.182 662
18	16.878 953	93.405 608	.010 706	.059 245	5.533 851	.180 706
19	19.748 375	110.284 561	.009 067	.050 637	5.584 488	.179 067
20	23.105 599	130.032 936	.007 690	.043 280	5.627 767	.177 690
21	27.033 551	153.138 535	.006 530	.036 991	5.664 758	.176 530
22	31.629 255	180.172 086	.005 550	.031 616	5.696 375	.175 550
23	37.006 228	211.801 341	.004 721	.027 022	5.723 397	.174 721
24	43.297 287	248.807 569	.004 019	.023 096	5.746 493	.174 019
25	50.657 826	292.104 856	.003 423	.019 740	5.766 234	.173 423
26	59.269 656	342.762 681	.002 917	.016 872	5.783 106	.172 917
27	69.345 497	402.032 337	.002 487	.014 421	5.797 526	.172 487
28	81.134 232	471.377 835	.002 121	.012 325	5.809 851	.172 121
29	94.927 051	552.512 066	.001 810	.010 534	5.820 386	.171 810
30	111.064 650	647.439 118	.001 545	.009 004	5.829 390	.171 545
31	129.945 641	758.503 768	.001 318	.007 696	5.837 085	.171 318
32	152.036 399	888.449 408	.001 126	.006 577	5.843 663	.171 126
33	177.882 587	1040.485 808	.000 961	.005 622	5.849 284	.170 961
34	208.122 627	1218.368 395	.000 821	.004 805	5.854 089	.170 821
35	243.503 474	1426.491 022	.000 701	.004 107	5.858 196	.170 701
36	284.899 064	1669.994 496	.000 599	.003 510	5.861 706	.170 599
37	333.331 905	1954.893 560	.000 512	.003 000	5.864 706	.170 512
38	389.998 329	2288.225 465	.000 437	.002 564	5.867 270	.170 437
39	456.298 045	2678.223 794	.000 373	.002 192	5.869 461	.170 373
40	533.868 713	3134.521 839	.000 319	.001 873	5.871 335	.170 319
41	624.626 394	3668.390 552	.000 273	.001 601	5.872 936	.170 273
42	730.812 881	4293.016 946	.000 233	.001 368	5.874 304	.170 233
43	855.051 071	5023.829 827	.000 199	.001 170	5.875 473	.170 199
44	1000.409 753	5878.880 897	.000 170	.001 000	5.876 473	.170 170
45	1170.479 411	6879.290 650	.000 145	.000 854	5.877 327	.170 145
46	1369.460 910	8049.770 061	.000 124	.000 730	5.878 058	.170 124
47	1602.269 265	9419.230 971	.000 106	.000 624	5.878 682	.170 106
48	1874.655 040	11021.500 236	.000 091	.000 533	5.879 215	.170 091
49	2193.346 397	12896.155 276	.000 078	.000 456	5.879 671	.170 078
50	2566.215 284	15089.501 673	.000 066	.000 390	5.880 061	.170 066
51	3002.471 883	17655.716 957	.000 057	.000 333	5.880 394	.170 057
52	3512.892 103	20658.188 840	.000 048	.000 285	5.880 678	.170 048
53	4110.083 760	24171.080 943	.000 041	.000 243	5.880 922	.170 041
54	4808.798 000	28281.164 703	.000 035	.000 208	5.881 130	.170 035
55	5626.293 659	33089.962 703	.000 030	.000 178	5.881 307	.170 030
56	6582.763 582	38716.256 362	.000 026	.000 152	5.881 459	.170 026
57	7701.833 390	45299.019 944	.000 022	.000 130	5.881 589	.170 022
58	9011.145 067	53000.853 334	.000 019	.000 111	5.881 700	.170 019
59	10543.039 728	62011.998 401	.000 016	.000 095	5.881 795	.170 016
60	12335.356 482	72555.038 129	.000 014	.000 081	5.881 876	.170 014
	$S^n = (1+i)^n$	$S_{\overline{n}|} = \frac{S^n - 1}{i}$	$1/S_{\overline{n}|} = \frac{i}{S^n - 1}$	$V^n = \frac{1}{S^n}$	$A_{\overline{n}|} = \frac{1 - 1/S^n}{i}$	$\frac{1}{A_{\overline{n}|}} = \frac{i}{1 - 1/S^n}$

YEARS	1 AMOUNT OF ONE	2 AMOUNT OF ONE PER PERIOD	3 SINKING FUND FACTOR	4 PRESENT WORTH OF ONE	5 PRESENT WORTH ONE PER PERIOD	6 PARTIAL PAYMENT
1	1.180 000	1.000 000	1.000 000	.847 458	.847 458	1.180 000
2	1.392 400	2.180 000	.458 716	.718 184	1.565 642	.638 716
3	1.643 032	3.572 400	.279 924	.608 631	2.174 273	.459 924
4	1.938 778	5.215 432	.191 739	.515 789	2.690 062	.371 739
5	2.287 758	7.154 210	.139 778	.437 109	3.127 171	.319 778
6	2.699 554	9.441 968	.105 910	.370 432	3.497 603	.285 910
7	3.185 474	12.141 522	.082 362	.313 925	3.811 528	.262 362
8	3.758 859	15.326 996	.065 244	.266 038	4.077 566	.245 244
9	4.435 454	19.085 855	.052 395	.225 456	4.303 022	.232 395
10	5.233 836	23.521 309	.042 515	.191 064	4.494 086	.222 515
11	6.175 926	28.755 144	.034 776	.161 919	4.656 005	.214 776
12	7.287 593	34.931 070	.028 628	.137 220	4.793 225	.208 628
13	8.599 359	42.218 663	.023 686	.116 288	4.909 513	.203 686
14	10.147 244	50.818 022	.019 678	.098 549	5.008 062	.199 678
15	11.973 748	60.965 266	.016 403	.083 516	5.091 578	.196 403
16	14.129 023	72.939 014	.013 710	.070 776	5.162 354	.193 710
17	16.672 247	87.068 036	.011 485	.059 980	5.222 334	.191 485
18	19.673 251	103.740 283	.009 639	.050 830	5.273 164	.189 639
19	23.214 436	123.413 534	.008 103	.043 077	5.316 241	.188 103
20	27.393 035	146.627 970	.006 820	.036 506	5.352 746	.186 820
21	32.323 781	174.021 005	.005 746	.030 937	5.383 683	.185 746
22	38.142 061	206.344 785	.004 846	.026 218	5.409 901	.184 846
23	45.007 632	244.486 847	.004 090	.022 218	5.432 120	.184 090
24	53.109 006	289.494 479	.003 454	.018 829	5.450 949	.183 454
25	62.668 627	342.603 486	.002 919	.015 957	5.466 906	.182 919
26	73.948 980	405.272 113	.002 467	.013 523	5.480 429	.182 467
27	87.259 797	479.221 093	.002 087	.011 460	5.491 889	.182 087
28	102.966 560	566.480 890	.001 765	.009 712	5.501 601	.181 765
29	121.500 541	669.447 450	.001 494	.008 230	5.509 831	.181 494
30	143.370 638	790.947 991	.001 264	.006 975	5.516 806	.181 264
31	169.177 353	934.318 630	.001 070	.005 911	5.522 717	.181 070
32	199.629 277	1103.495 983	.000 906	.005 009	5.527 726	.180 906
33	235.562 547	1303.125 260	.000 767	.004 245	5.531 971	.180 767
34	277.963 805	1538.687 807	.000 650	.003 598	5.535 569	.180 650
35	327.997 290	1816.651 612	.000 550	.003 049	5.538 618	.180 550
36	387.036 802	2144.648 902	.000 466	.002 584	5.541 201	.180 466
37	456.703 427	2531.685 705	.000 395	.002 190	5.543 391	.180 395
38	538.910 044	2988.389 132	.000 335	.001 856	5.545 247	.180 335
39	635.913 852	3527.299 175	.000 284	.001 573	5.546 819	.180 284
40	750.378 345	4163.213 027	.000 240	.001 333	5.548 152	.180 240
41	885.446 447	4913.591 372	.000 204	.001 129	5.549 281	.180 204
42	1044.826 807	5799.037 819	.000 172	.000 957	5.550 238	.180 172
43	1232.895 633	6843.864 626	.000 146	.000 811	5.551 049	.180 146
44	1454.816 847	8076.760 259	.000 124	.000 687	5.551 737	.180 124
45	1716.683 879	9531.577 105	.000 105	.000 583	5.552 319	.180 105
46	2025.686 977	11248.260 984	.000 089	.000 494	5.552 813	.180 089
47	2390.310 633	13273.947 961	.000 075	.000 418	5.553 231	.180 075
48	2820.566 547	15664.258 594	.000 064	.000 355	5.553 586	.180 064
49	3328.268 525	18484.825 141	.000 054	.000 300	5.553 886	.180 054
50	3927.356 860	21813.093 666	.000 046	.000 255	5.554 141	.180 046
51	4634.281 095	25740.450 526	.000 039	.000 216	5.554 357	.180 039
52	5468.451 692	30374.731 621	.000 033	.000 183	5.554 540	.180 033
53	6452.772 996	35843.183 313	.000 028	.000 155	5.554 695	.180 028
54	7614.272 136	42295.956 309	.000 024	.000 131	5.554 826	.180 024
55	8984.841 120	49910.228 445	.000 020	.000 111	5.554 937	.180 020
	$S^n = (1+i)^n$	$S_{\overline{n}|} = \frac{S^n - 1}{i}$	$1/S_{\overline{n}|} = \frac{i}{S^n - 1}$	$V^n = \frac{1}{S^n}$	$A_{\overline{n}|} = \frac{1 - 1/S^n}{i}$	$\frac{1}{A_{\overline{n}|}} = \frac{i}{1 - 1/S^n}$

YEARS	1 AMOUNT OF ONE	2 AMOUNT OF ONE PER PERIOD	3 SINKING FUND FACTOR	4 PRESENT WORTH OF ONE	5 PRESENT WORTH ONE PER PERIOD	6 PARTIAL PAYMENT
1	1.190 000	1.000 000	1.000 000	.840 336	.840 336	1.190 000
2	1.416 100	2.190 000	.456 621	.706 165	1.546 501	.646 621
3	1.685 159	3.606 100	.277 308	.593 416	2.139 917	.467 308
4	2.005 339	5.291 259	.188 991	.498 669	2.638 586	.378 991
5	2.386 354	7.296 598	.137 050	.419 049	3.057 635	.327 050
6	2.839 761	9.682 952	.103 274	.352 142	3.409 777	.293 274
7	3.379 315	12.522 713	.079 855	.295 918	3.705 695	.269 855
8	4.021 385	15.902 028	.062 885	.248 671	3.954 366	.252 885
9	4.785 449	19.923 413	.050 192	.208 967	4.163 332	.240 192
10	5.694 684	24.708 862	.040 471	.175 602	4.338 935	.230 471
11	6.776 674	30.403 546	.032 891	.147 565	4.486 500	.222 891
12	8.064 242	37.180 220	.026 896	.124 004	4.610 504	.216 896
13	9.596 448	45.244 461	.022 102	.104 205	4.714 709	.212 102
14	11.419 773	54.840 909	.018 235	.087 567	4.802 277	.208 235
15	13.589 530	66.260 682	.015 092	.073 586	4.875 863	.205 092
16	16.171 540	79.850 211	.012 523	.061 837	4.937 700	.202 523
17	19.244 133	96.021 751	.010 414	.051 964	4.989 664	.200 414
18	22.900 518	115.265 884	.008 676	.043 667	5.033 331	.198 676
19	27.251 616	138.166 402	.007 238	.036 695	5.070 026	.197 238
20	32.429 423	165.418 018	.006 045	.030 836	5.100 862	.196 045
21	38.591 014	197.847 442	.005 054	.025 913	5.126 775	.195 054
22	45.923 307	236.438 456	.004 229	.021 775	5.148 550	.194 229
23	54.648 735	282.361 762	.003 542	.018 299	5.166 849	.193 542
24	65.031 994	337.010 497	.002 967	.015 377	5.182 226	.192 967
25	77.388 073	402.042 491	.002 487	.012 922	5.195 148	.192 487
26	92.091 807	479.430 565	.002 086	.010 859	5.206 007	.192 086
27	109.589 251	571.522 372	.001 750	.009 125	5.215 132	.191 750
28	130.411 208	681.111 623	.001 468	.007 668	5.222 800	.191 468
29	155.189 338	811.522 831	.001 232	.006 444	5.229 243	.191 232
30	184.675 312	966.712 169	.001 034	.005 415	5.234 658	.191 034
31	219.763 621	1151.387 481	.000 869	.004 550	5.239 209	.190 869
32	261.518 710	1371.151 103	.000 729	.003 824	5.243 033	.190 729
33	311.207 264	1632.669 812	.000 612	.003 213	5.246 246	.190 612
34	370.336 645	1943.877 077	.000 514	.002 700	5.248 946	.190 514
35	440.700 607	2314.213 721	.000 432	.002 269	5.251 215	.190 432
36	524.433 722	2754.914 328	.000 363	.001 907	5.253 122	.190 363
37	624.076 130	3279.348 051	.000 305	.001 602	5.254 724	.190 305
38	742.650 594	3903.424 180	.000 256	.001 347	5.256 071	.190 256
39	883.754 207	4646.074 775	.000 215	.001 132	5.257 202	.190 215
40	1051.667 507	5529.828 982	.000 181	.000 951	5.258 153	.190 181
41	1251.484 333	6581.496 488	.000 152	.000 799	5.258 952	.190 152
42	1489.266 356	7832.980 821	.000 128	.000 671	5.259 624	.190 128
43	1772.226 964	9322.247 177	.000 107	.000 564	5.260 188	.190 107
44	2108.950 087	11094.474 141	.000 090	.000 474	5.260 662	.190 090
45	2509.650 603	13203.424 228	.000 076	.000 398	5.261 061	.190 076
46	2986.484 218	15713.074 831	.000 064	.000 335	5.261 396	.190 064
47	3553.916 219	18699.559 049	.000 053	.000 281	5.261 677	.190 053
48	4229.160 301	22253.475 268	.000 045	.000 236	5.261 913	.190 045
49	5032.700 758	26482.635 569	.000 038	.000 199	5.262 112	.190 038
50	5988.913 902	31515.336 327	.000 032	.000 167	5.262 279	.190 032
51	7126.807 544	37504.250 230	.000 027	.000 140	5.262 419	.190 027
52	8480.900 977	44631.057 773	.000 022	.000 118	5.262 537	.190 022
53	10092.272 163	53111.958 750	.000 019	.000 099	5.262 636	.190 019
54	12009.803 873	63204.230 913	.000 016	.000 083	5.262 720	.190 016
55	14291.666 609	75214.034 786	.000 013	.000 070	5.262 790	.190 013
	$S^n = (1+i)^n$	$S_{\overline{n}|} = \frac{S^n - 1}{i}$	$1/S_{\overline{n}|} = \frac{i}{S^n - 1}$	$V^n = \frac{1}{S^n}$	$A_{\overline{n}|} = \frac{1 - 1/S^n}{i}$	$\frac{1}{A_{\overline{n}|}} = \frac{i}{1 - 1/S^n}$

YEARS	1 AMOUNT OF ONE	2 AMOUNT OF ONE PER PERIOD	3 SINKING FUND FACTOR	4 PRESENT WORTH OF ONE	5 PRESENT WORTH ONE PER PERIOD	6 PARTIAL PAYMENT
1	1.200 000	1.000 000	1.000 000	.833 333	.833 333	1.200 000
2	1.440 000	2.200 000	.454 545	.694 444	1.527 778	.654 545
3	1.728 000	3.640 000	.274 725	.578 704	2.106 481	.474 725
4	2.073 600	5.368 000	.186 289	.482 253	2.588 735	.386 289
5	2.488 320	7.441 600	.134 380	.401 878	2.990 612	.334 380
6	2.985 984	9.929 920	.100 706	.334 898	3.325 510	.300 706
7	3.583 181	12.915 904	.077 424	.279 082	3.604 592	.277 424
8	4.299 817	16.499 085	.060 609	.232 568	3.837 160	.260 609
9	5.159 780	20.798 902	.048 079	.193 807	4.030 967	.248 079
10	6.191 736	25.958 682	.038 523	.161 506	4.192 472	.238 523
11	7.430 084	32.150 419	.031 104	.134 588	4.327 060	.231 104
12	8.916 100	39.580 502	.025 265	.112 157	4.439 217	.225 265
13	10.699 321	48.496 603	.020 620	.093 464	4.532 681	.220 620
14	12.839 185	59.195 923	.016 893	.077 887	4.610 567	.216 893
15	15.407 022	72.035 108	.013 882	.064 905	4.675 473	.213 882
16	18.488 426	87.442 129	.011 436	.054 088	4.729 561	.211 436
17	22.186 111	105.930 555	.009 440	.045 073	4.774 634	.209 440
18	26.623 333	128.116 666	.007 805	.037 561	4.812 195	.207 805
19	31.948 000	154.740 000	.006 462	.031 301	4.843 496	.206 462
20	38.337 600	186.688 000	.005 357	.026 084	4.869 580	.205 357
21	46.005 120	225.025 600	.004 444	.021 737	4.891 316	.204 444
22	55.206 144	271.030 719	.003 690	.018 114	4.909 430	.203 690
23	66.247 373	326.236 863	.003 065	.015 095	4.924 525	.203 065
24	79.496 847	392.484 236	.002 548	.012 579	4.937 104	.202 548
25	95.396 217	471.981 083	.002 119	.010 483	4.947 587	.202 119
26	114.475 460	567.377 300	.001 762	.008 735	4.956 323	.201 762
27	137.370 552	681.852 760	.001 467	.007 280	4.963 602	.201 467
28	164.844 662	819.223 312	.001 221	.006 066	4.969 668	.201 221
29	197.813 595	984.067 974	.001 016	.005 055	4.974 724	.201 016
30	237.376 314	1181.881 569	.000 846	.004 213	4.978 936	.200 846
31	284.851 577	1419.257 883	.000 705	.003 511	4.982 447	.200 705
32	341.821 892	1704.109 459	.000 587	.002 926	4.985 372	.200 587
33	410.186 270	2045.931 351	.000 489	.002 438	4.987 810	.200 489
34	492.223 524	2456.117 621	.000 407	.002 032	4.989 842	.200 407
35	590.668 229	2948.341 146	.000 339	.001 693	4.991 535	.200 339
36	708.801 875	3539.009 375	.000 283	.001 411	4.992 946	.200 283
37	850.562 250	4247.811 250	.000 235	.001 176	4.994 122	.200 235
38	1020.674 700	5098.373 500	.000 196	.000 980	4.995 101	.200 196
39	1224.809 640	6119.048 200	.000 163	.000 816	4.995 918	.200 163
40	1469.771 568	7343.857 840	.000 136	.000 680	4.996 598	.200 136
41	1763.725 882	8813.629 408	.000 113	.000 567	4.997 165	.200 113
42	2116.471 058	10577.355 289	.000 095	.000 472	4.997 638	.200 095
43	2539.765 269	12693.826 347	.000 079	.000 394	4.998 031	.200 079
44	3047.718 323	15233.591 617	.000 066	.000 328	4.998 359	.200 066
45	3657.261 988	18281.309 940	.000 055	.000 273	4.998 633	.200 055
46	4388.714 386	21938.571 928	.000 046	.000 228	4.998 861	.200 046
47	5266.457 263	26327.286 314	.000 038	.000 190	4.999 051	.200 038
48	6319.748 715	31593.743 576	.000 032	.000 158	4.999 209	.200 032
49	7583.698 458	37913.492 292	.000 026	.000 132	4.999 341	.200 026
50	9100.438 150	45497.190 750	.000 022	.000 110	4.999 451	.200 022
	$S^n = (1+i)^n$	$S_{\overline{n}|} = \frac{S^n - 1}{i}$	$1/S_{\overline{n}|} = \frac{i}{S^n - 1}$	$V^n = \frac{1}{S^n}$	$A_{\overline{n}|} = \frac{1 - 1/S^n}{i}$	$\frac{1}{A_{\overline{n}|}} = \frac{i}{1 \quad 1/S^n}$

YEARS	1 AMOUNT OF ONE	2 AMOUNT OF ONE PER PERIOD	3 SINKING FUND FACTOR	4 PRESENT WORTH OF ONE	5 PRESENT WORTH ONE PER PERIOD	6 PARTIAL PAYMENT
1	1.210 000	1.000 000	1.000 000	.826 446	.826 446	1.210 000
2	1.464 100	2.210 000	.452 489	.683 013	1.509 460	.662 489
3	1.771 561	3.674 100	.272 175	.564 474	2.073 934	.482 175
4	2.143 589	5.445 661	.183 632	.466 507	2.540 441	.393 632
5	2.593 742	7.589 250	.131 765	.385 543	2.925 984	.341 765
6	3.138 428	10.182 992	.098 203	.318 631	3.244 615	.308 203
7	3.797 498	13.321 421	.075 067	.263 331	3.507 946	.285 067
8	4.594 973	17.118 919	.058 415	.217 629	3.725 576	.268 415
9	5.559 917	21.713 892	.046 053	.179 859	3.905 434	.256 053
10	6.727 500	27.273 809	.036 665	.148 644	4.054 078	.246 665
11	8.140 275	34.001 309	.029 411	.122 846	4.176 924	.239 411
12	9.849 733	42.141 584	.023 730	.101 526	4.278 450	.233 730
13	11.918 177	51.991 317	.019 234	.083 905	4.362 355	.229 234
14	14.420 994	63.909 493	.015 647	.069 343	4.431 698	.225 647
15	17.449 402	78.330 487	.012 766	.057 309	4.489 007	.222 766
16	21.113 777	95.779 889	.010 441	.047 362	4.536 369	.220 441
17	25.547 670	116.893 666	.008 555	.039 143	4.575 512	.218 555
18	30.912 681	142.441 336	.007 020	.032 349	4.607 861	.217 020
19	37.404 343	173.354 016	.005 769	.026 735	4.634 596	.215 769
20	45.259 256	210.758 360	.004 745	.022 095	4.656 691	.214 745
21	54.763 699	256.017 615	.003 906	.018 260	4.674 951	.213 906
22	66.264 076	310.781 315	.003 218	.015 091	4.690 042	.213 218
23	80.179 532	377.045 391	.002 652	.012 472	4.702 514	.212 652
24	97.017 234	457.224 923	.002 187	.010 307	4.712 822	.212 187
25	117.390 853	554.242 157	.001 804	.008 519	4.721 340	.211 804
26	142.042 932	671.633 009	.001 489	.007 040	4.728 380	.211 489
27	171.871 948	813.675 941	.001 229	.005 818	4.734 199	.211 229
28	207.965 057	985.547 889	.001 015	.004 809	4.739 007	.211 015
29	251.637 719	1193.512 946	.000 838	.003 974	4.742 981	.210 838
30	304.481 640	1445.150 664	.000 692	.003 284	4.746 265	.210 692
31	368.422 784	1749.632 304	.000 572	.002 714	4.748 980	.210 572
32	445.791 568	2118.055 088	.000 472	.002 243	4.751 223	.210 472
33	539.407 798	2563.846 656	.000 390	.001 854	4.753 077	.210 390
34	652.683 435	3103.254 454	.000 322	.001 532	4.754 609	.210 322
35	789.746 957	3755.937 890	.000 266	.001 266	4.755 875	.210 266
36	955.593 818	4545.684 846	.000 220	.001 046	4.756 922	.210 220
37	1156.268 519	5501.278 664	.000 182	.000 865	4.757 786	.210 182
38	1399.084 909	6657.547 183	.000 150	.000 715	4.758 501	.210 150
39	1692.892 739	8056.632 092	.000 124	.000 591	4.759 092	.210 124
40	2048.400 215	9749.524 831	.000 103	.000 488	4.759 580	.210 103
41	2478.564 260	11797.925 046	.000 085	.000 403	4.759 984	.210 085
42	2999.062 754	14276.489 306	.000 070	.000 333	4.760 317	.210 070
43	3628.865 933	17275.552 060	.000 058	.000 276	4.760 593	.210 058
44	4390.927 778	20904.417 992	.000 048	.000 228	4.760 820	.210 048
45	5313.022 612	25295.345 771	.000 040	.000 188	4.761 008	.210 040
46	6428.757 360	30608.368 383	.000 033	.000 156	4.761 164	.210 033
47	7778.796 406	37037.125 743	.000 027	.000 129	4.761 293	.210 027
48	9412.343 651	44815.922 149	.000 022	.000 106	4.761 399	.210 022
49	11388.935 818	54228.265 800	.000 018	.000 088	4.761 487	.210 018
50	13780.612 340	65617.201 618	.000 015	.000 073	4.761 559	.210 015
	$S^n = (1+i)^n$	$S_{\overline{n}} = \frac{S^n - 1}{i}$	$1/S_{\overline{n}} = \frac{i}{S^n - 1}$	$V^n = \frac{1}{S^n}$	$A_{\overline{n}} = \frac{1 - 1/S^n}{i}$	$\frac{1}{A_{\overline{n}}} = \frac{i}{1 - 1/S^n}$

YEARS	1 AMOUNT OF ONE	2 AMOUNT OF ONE PER PERIOD	3 SINKING FUND FACTOR	4 PRESENT WORTH OF ONE	5 PRESENT WORTH ONE PER PERIOD	6 PARTIAL PAYMENT
1	1.220 000	1.000 000	1.000 000	.819 672	.819 672	1.220 000
2	1.488 400	2.220 000	.450 450	.671 862	1.491 535	.670 450
3	1.815 848	3.708 400	.269 658	.550 707	2.042 241	.489 658
4	2.215 335	5.524 248	.181 020	.451 399	2.493 641	.401 020
5	2.702 708	7.739 583	.129 206	.369 999	2.863 640	.349 206
6	3.297 304	10.442 291	.095 764	.303 278	3.166 918	.315 764
7	4.022 711	13.739 595	.072 782	.248 589	3.415 506	.292 782
8	4.907 707	17.762 306	.056 299	.203 761	3.619 268	.276 299
9	5.987 403	22.670 013	.044 111	.167 017	3.786 285	.264 111
10	7.304 631	28.657 416	.034 895	.136 899	3.923 184	.254 895
11	8.911 650	35.962 047	.027 807	.112 213	4.035 397	.247 807
12	10.872 213	44.873 697	.022 285	.091 978	4.127 375	.242 285
13	13.264 100	55.745 911	.017 939	.075 391	4.202 766	.237 939
14	16.182 202	69.010 011	.014 491	.061 796	4.264 562	.234 491
15	19.742 287	85.192 213	.011 738	.050 653	4.315 215	.231 738
16	24.085 590	104.934 500	.009 530	.041 519	4.356 734	.229 530
17	29.384 420	129.020 090	.007 751	.034 032	4.390 765	.227 751
18	35.848 992	158.404 510	.006 313	.027 895	4.418 660	.226 313
19	43.735 771	194.253 503	.005 148	.022 865	4.441 525	.225 148
20	53.357 640	237.989 273	.004 202	.018 741	4.460 266	.224 202
21	65.096 321	291.346 913	.003 432	.015 362	4.475 628	.223 432
22	79.417 512	356.443 234	.002 805	.012 592	4.488 220	.222 805
23	96.889 364	435.860 746	.002 294	.010 321	4.498 541	.222 294
24	118.205 024	532.750 110	.001 877	.008 460	4.507 001	.221 877
25	144.210 130	650.955 134	.001 536	.006 934	4.513 935	.221 536
26	175.936 358	795.165 264	.001 258	.005 684	4.519 619	.221 258
27	214.642 357	971.101 622	.001 030	.004 659	4.524 278	.221 030
28	261.863 675	1185.743 978	.000 843	.003 819	4.528 096	.220 843
29	319.473 684	1447.607 654	.000 691	.003 130	4.531 227	.220 691
30	389.757 894	1767.081 337	.000 566	.002 566	4.533 792	.220 566
31	475.504 631	2156.839 232	.000 464	.002 103	4.535 895	.220 464
32	580.115 650	2632.343 863	.000 380	.001 724	4.537 619	.220 380
33	707.741 093	3212.459 512	.000 311	.001 413	4.539 032	.220 311
34	863.444 133	3920.200 605	.000 255	.001 158	4.540 190	.220 255
35	1053.401 842	4783.644 738	.000 209	.000 949	4.541 140	.220 209
36	1285.150 248	5837.046 581	.000 171	.000 778	4.541 918	.220 171
37	1567.883 302	7122.196 829	.000 140	.000 638	4.542 555	.220 140
38	1912.817 629	8690.080 131	.000 115	.000 523	4.543 078	.220 115
39	2333.637 507	10602.897 760	.000 094	.000 429	4.543 507	.220 094
40	2847.037 759	12936.535 267	.000 077	.000 351	4.543 858	.220 077
41	3473.386 066	15783.573 025	.000 063	.000 288	4.544 146	.220 063
42	4237.531 000	19256.959 091	.000 052	.000 236	4.544 382	.220 052
43	5169.787 820	23494.490 091	.000 043	.000 193	4.544 575	.220 043
44	6307.141 140	28664.277 911	.000 035	.000 159	4.544 734	.220 035
45	7694.712 191	34971.419 051	.000 029	.000 130	4.544 864	.220 029
46	9387.548 873	42666.131 243	.000 023	.000 107	4.544 970	.220 023
47	11452.809 626	52053.680 116	.000 019	.000 087	4.545 058	.220 019
48	13972.427 743	63506.489 742	.000 016	.000 072	4.545 129	.220 016
49	17046.361 847	77478.917 485	.000 013	.000 059	4.545 188	.220 013
50	20796.561 453	94525.279 331	.000 011	.000 048	4.545 236	.220 011
	$S^n = (1+i)^n$	$S_{\overline{n}\rceil} = \frac{S^n - 1}{i}$	$1/S_{\overline{n}\rceil} = \frac{i}{S^n - 1}$	$V^n = \frac{1}{S^n}$	$A_{\overline{n}\rceil} = \frac{1 - 1/S^n}{i}$	$\frac{1}{A_{\overline{n}\rceil}} = \frac{i}{1 - 1/S^n}$

YEARS	1 AMOUNT OF ONE	2 AMOUNT OF ONE PER PERIOD	3 SINKING FUND FACTOR	4 PRESENT WORTH OF ONE	5 PRESENT WORTH ONE PER PERIOD	6 PARTIAL PAYMENT
1	1.230 000	1.000 000	1.000 000	.813 008	.813 008	1.230 000
2	1.512 900	2.230 000	.448 430	.660 982	1.473 990	.678 430
3	1.860 867	3.742 900	.267 173	.537 384	2.011 374	.497 173
4	2.288 866	5.603 767	.178 451	.436 897	2.448 272	.408 451
5	2.815 306	7.892 633	.126 700	.355 201	2.803 473	.356 700
6	3.462 826	10.707 939	.093 389	.288 781	3.092 254	.323 389
7	4.259 276	14.170 765	.070 568	.234 782	3.327 036	.300 568
8	5.238 909	18.430 041	.054 259	.190 879	3.517 916	.284 259
9	6.443 859	23.668 950	.042 249	.155 187	3.673 102	.272 249
10	7.925 946	30.112 809	.033 208	.126 168	3.799 270	.263 208
11	9.748 914	38.038 755	.026 289	.102 576	3.901 846	.256 289
12	11.991 164	47.787 669	.020 926	.083 395	3.985 240	.250 926
13	14.749 132	59.778 833	.016 728	.067 801	4.053 041	.246 728
14	18.141 432	74.527 964	.013 418	.055 122	4.108 163	.243 418
15	22.313 961	92.669 396	.010 791	.044 815	4.152 978	.240 791
16	27.446 172	114.983 357	.008 697	.036 435	4.189 413	.238 697
17	33.758 792	142.429 529	.007 021	.029 622	4.219 035	.237 021
18	41.523 314	176.188 321	.005 676	.024 083	4.243 118	.235 676
19	51.073 676	217.711 635	.004 593	.019 580	4.262 698	.234 593
20	62.820 622	268.785 311	.003 720	.015 918	4.278 616	.233 720
21	77.269 364	331.605 932	.003 016	.012 942	4.291 558	.233 016
22	95.041 318	408.875 297	.002 446	.010 522	4.302 079	.232 446
23	116.900 822	503.916 615	.001 984	.008 554	4.310 634	.231 984
24	143.788 010	620.817 437	.001 611	.006 955	4.317 588	.231 611
25	176.859 253	764.605 447	.001 308	.005 654	4.323 243	.231 308
26	217.536 881	941.464 700	.001 062	.004 597	4.327 839	.231 062
27	267.570 364	1159.001 581	.000 863	.003 737	4.331 577	.230 863
28	329.111 547	1426.571 945	.000 701	.003 038	4.334 615	.230 701
29	404.807 203	1755.683 492	.000 570	.002 470	4.337 086	.230 570
30	497.912 860	2160.490 695	.000 463	.002 008	4.339 094	.230 463
31	612.432 818	2658.403 555	.000 376	.001 633	4.340 727	.230 376
32	753.292 366	3270.836 373	.000 306	.001 328	4.342 054	.230 306
33	926.549 610	4024.128 738	.000 249	.001 079	4.343 134	.230 249
34	1139.656 020	4950.678 348	.000 202	.000 877	4.344 011	.230 202
35	1401.776 905	6090.334 368	.000 164	.000 713	4.344 724	.230 164
36	1724.185 593	7492.111 273	.000 133	.000 560	4.345 304	.230 133
37	2120.748 279	9216.296 866	.000 109	.000 472	4.345 776	.230 109
38	2608.520 383	11337.045 145	.000 088	.000 383	4.346 159	.230 088
39	3208.480 071	13945.565 528	.000 072	.000 312	4.346 471	.230 072
40	3946.430 488	17154.045 599	.000 058	.000 253	4.346 724	.230 058
41	4854.109 500	21100.476 087	.000 047	.000 206	4.346 930	.230 047
42	5970.554 685	25954.585 587	.000 039	.000 167	4.347 098	.230 039
43	7343.782 263	31925.140 272	.000 031	.000 136	4.347 234	.230 031
44	9032.852 183	39268.922 535	.000 025	.000 111	4.347 345	.230 025
45	11110.408 185	48301.774 718	.000 021	.000 090	4.347 435	.230 021
	$S^n = (1+i)^n$	$S_{\overline{n}|} = \frac{S^n - 1}{i}$	$1/S_{\overline{n}|} = \frac{i}{S^n - 1}$	$V^n = \frac{1}{S^n}$	$A_{\overline{n}|} = \frac{1 - 1/S^n}{i}$	$\frac{1}{A_{\overline{n}|}} = \frac{i}{1 - 1/S^n}$

YEARS	1 AMOUNT OF ONE	2 AMOUNT OF ONE PER PERIOD	3 SINKING FUND FACTOR	4 PRESENT WORTH OF ONE	5 PRESENT WORTH ONE PER PERIOD	6 PARTIAL PAYMENT
1	1.240 000	1.000 000	1.000 000	.806 452	.806 452	1.240 000
2	1.537 600	2.240 000	.446 429	.650 364	1.456 816	.686 429
3	1.906 624	3.777 600	.264 718	.524 487	1.981 303	.504 718
4	2.364 214	5.684 224	.175 926	.422 974	2.404 277	.415 926
5	2.931 625	8.048 438	.124 248	.341 108	2.745 384	.364 248
6	3.635 215	10.980 063	.091 074	.275 087	3.020 471	.331 074
7	4.507 667	14.615 278	.068 422	.221 844	3.242 316	.308 422
8	5.589 507	19.122 945	.052 293	.178 907	3.421 222	.292 293
9	6.930 988	24.712 451	.040 465	.144 280	3.565 502	.280 465
10	8.594 426	31.643 440	.031 602	.116 354	3.681 856	.271 602
11	10.657 088	40.237 865	.024 852	.093 834	3.775 691	.264 852
12	13.214 789	50.894 953	.019 648	.075 673	3.851 363	.259 648
13	16.386 338	64.109 741	.015 598	.061 026	3.912 390	.255 598
14	20.319 059	80.496 079	.012 423	.049 215	3.961 605	.252 423
15	25.195 633	100.815 138	.009 919	.039 689	4.001 294	.249 919
16	31.242 585	126.010 772	.007 936	.032 008	4.033 302	.247 936
17	38.740 806	157.253 357	.006 359	.025 813	4.059 114	.246 359
18	48.038 599	195.994 162	.005 102	.020 817	4.079 931	.245 102
19	59.567 863	244.032 761	.004 098	.016 788	4.096 718	.244 098
20	73.864 150	303.600 624	.003 294	.013 538	4.110 257	.243 294
21	91.591 546	377.464 774	.002 649	.010 918	4.121 175	.242 649
22	113.573 517	469.056 320	.002 132	.008 805	4.129 980	.242 132
23	140.831 161	582.629 836	.001 716	.007 101	4.137 080	.241 716
24	174.630 639	723.460 997	.001 382	.005 726	4.142 807	.241 382
25	216.541 993	898.091 636	.001 113	.004 618	4.147 425	.241 113
26	268.512 071	1114.633 629	.000 897	.003 724	4.151 149	.240 897
27	332.954 968	1383.145 700	.000 723	.003 003	4.154 152	.240 723
28	412.864 160	1716.100 668	.000 583	.002 422	4.156 575	.240 583
29	511.951 559	2128.964 828	.000 470	.001 953	4.158 528	.240 470
30	634.819 933	2640.916 387	.000 379	.001 575	4.160 103	.240 379
31	787.176 717	3275.736 320	.000 305	.001 270	4.161 373	.240 305
32	976.099 129	4062.913 037	.000 246	.001 024	4.162 398	.240 246
33	1210.362 920	5039.012 166	.000 198	.000 826	4.163 224	.240 198
34	1500.850 021	6249.375 086	.000 160	.000 666	4.163 890	.240 160
35	1861.054 026	7750.225 106	.000 129	.000 537	4.164 428	.240 129
36	2307.706 992	9611.279 132	.000 104	.000 433	4.164 861	.240 104
37	2861.556 670	11918.986 124	.000 084	.000 349	4.165 211	.240 084
38	3548.330 270	14780.542 793	.000 068	.000 282	4.165 492	.240 068
39	4399.929 535	18328.873 064	.000 055	.000 227	4.165 720	.240 055
40	5455.912 624	22728.802 599	.000 044	.000 183	4.165 903	.240 044
41	6765.331 653	28184.715 222	.000 035	.000 148	4.166 051	.240 035
42	8389.011 250	34950.046 876	.000 029	.000 119	4.166 170	.240 029
43	10402.373 950	43339.058 126	.000 023	.000 096	4.166 266	.240 023
44	12898.943 698	53741.432 076	.000 019	.000 078	4.166 344	.240 019
45	15994.690 186	66640.375 775	.000 015	.000 063	4.166 406	.240 015
	$S^n = (1+i)^n$	$S_{\overline{n}|} = \frac{S^n - 1}{i}$	$1/S_{\overline{n}|} = \frac{i}{S^n - 1}$	$V^n = \frac{1}{S^n}$	$A_{\overline{n}|} = \frac{1 - 1/S^n}{i}$	$\frac{1}{A_{\overline{n}|}} = \frac{i}{1 - 1/S^n}$

YEARS	1 AMOUNT OF ONE	2 AMOUNT OF ONE PER PERIOD	3 SINKING FUND FACTOR	4 PRESENT WORTH OF ONE	5 PRESENT WORTH ONE PER PERIOD	6 PARTIAL PAYMENT
1	1.250 000	1.000 000	1.000 000	.800 000	.800 000	1.250 000
2	1.562 500	2.250 000	.444 444	.640 000	1.440 000	.694 444
3	1.953 125	3.812 500	.262 295	.512 000	1.952 000	.512 295
4	2.441 406	5.765 625	.173 442	.409 600	2.361 600	.423 442
5	3.051 758	8.207 031	.121 847	.327 680	2.689 280	.371 847
6	3.814 697	11.258 789	.088 819	.262 144	2.951 424	.338 819
7	4.768 372	15.073 486	.066 342	.209 715	3.161 139	.316 342
8	5.960 464	19.841 858	.050 399	.167 772	3.328 911	.300 399
9	7.450 581	25.802 322	.038 756	.134 218	3.463 129	.288 756
10	9.313 226	33.252 903	.030 073	.107 374	3.570 503	.280 073
11	11.641 532	42.566 129	.023 493	.085 899	3.656 403	.273 493
12	14.551 915	54.207 661	.018 448	.068 719	3.725 122	.268 448
13	18.189 894	68.759 576	.014 543	.054 976	3.780 098	.264 543
14	22.737 368	86.949 470	.011 501	.043 980	3.824 078	.261 501
15	28.421 709	109.686 838	.009 117	.035 184	3.859 263	.259 117
16	35.527 137	138.108 547	.007 241	.028 147	3.887 410	.257 241
17	44.408 921	173.635 684	.005 759	.022 518	3.909 928	.255 759
18	55.511 151	218.044 605	.004 586	.018 014	3.927 942	.254 586
19	69.388 939	273.555 756	.003 656	.014 412	3.942 354	.253 656
20	86.736 174	342.944 695	.002 916	.011 529	3.953 883	.252 916
21	108.420 217	429.680 869	.002 327	.009 223	3.963 107	.252 327
22	135.525 272	538.101 086	.001 858	.007 379	3.970 485	.251 858
23	169.406 589	673.626 358	.001 485	.005 903	3.976 388	.251 485
24	211.758 237	843.032 947	.001 186	.004 722	3.981 111	.251 186
25	264.697 796	1054.791 184	.000 948	.003 778	3.984 888	.250 948
26	330.872 245	1319.488 980	.000 758	.003 022	3.987 911	.250 758
27	413.590 306	1650.361 225	.000 606	.002 418	3.990 329	.250 606
28	516.987 883	2063.951 531	.000 485	.001 934	3.992 263	.250 485
29	646.234 854	2580.939 414	.000 387	.001 547	3.993 810	.250 387
30	807.793 567	3227.174 268	.000 310	.001 238	3.995 048	.250 310
31	1009.741 959	4034.967 835	.000 248	.000 990	3.996 039	.250 248
32	1262.177 448	5044.709 793	.000 198	.000 792	3.996 831	.250 198
33	1577.721 810	6306.887 242	.000 159	.000 634	3.997 465	.250 159
34	1972.152 263	7884.609 052	.000 127	.000 507	3.997 972	.250 127
35	2465.190 329	9856.761 315	.000 101	.000 406	3.998 377	.250 101
36	3081.487 911	12321.951 644	.000 081	.000 325	3.998 702	.250 081
37	3851.859 889	15403.439 555	.000 065	.000 260	3.998 962	.250 065
38	4814.824 861	19255.299 444	.000 052	.000 208	3.999 169	.250 052
39	6018.531 076	24070.124 305	.000 042	.000 166	3.999 335	.250 042
40	7523.163 845	30088.655 381	.000 033	.000 133	3.999 468	.250 033
41	9403.954 807	37611.819 226	.000 027	.000 106	3.999 575	.250 027
42	11754.943 508	47015.774 033	.000 021	.000 085	3.999 660	.250 021
43	14693.679 385	58770.717 541	.000 017	.000 068	3.999 728	.250 017
44	18367.099 232	73464.396 926	.000 014	.000 054	3.999 782	.250 014
45	22958.874 039	91831.496 158	.000 011	.000 044	3.999 826	.250 011
	$S^n = (1+i)^n$	$S_{\overline{n}\rceil} = \frac{S^n - 1}{i}$	$1/S_{\overline{n}\rceil} = \frac{i}{S^n - 1}$	$V^n = \frac{1}{S^n}$	$A_{\overline{n}\rceil} = \frac{1 - 1/S^n}{i}$	$\frac{1}{A_{\overline{n}\rceil}} = \frac{i}{1 - 1/S^n}$

YEARS	1 AMOUNT OF ONE	2 AMOUNT OF ONE PER PERIOD	3 SINKING FUND FACTOR	4 PRESENT WORTH OF ONE	5 PRESENT WORTH ONE PER PERIOD	6 PARTIAL PAYMENT
1	1.260 000	1.000 000	1.000 000	.793 651	.793 651	1.260 000
2	1.587 600	2.260 000	.442 478	.629 882	1.423 532	.702 478
3	2.000 376	3.847 600	.259 902	.499 906	1.923 438	.519 902
4	2.520 474	5.847 976	.170 999	.396 751	2.320 189	.430 999
5	3.175 797	8.368 450	.119 496	.314 882	2.635 071	.379 496
6	4.001 504	11.544 247	.086 623	.249 906	2.884 977	.346 623
7	5.041 895	15.545 751	.064 326	.198 338	3.083 315	.324 326
8	6.352 788	20.587 646	.048 573	.157 411	3.240 726	.308 573
9	8.004 513	26.940 434	.037 119	.124 930	3.365 656	.297 119
10	10.085 686	34.944 947	.028 616	.099 150	3.464 806	.288 616
11	12.707 965	45.030 633	.022 207	.078 691	3.543 497	.282 207
12	16.012 035	57.738 598	.017 319	.062 453	3.605 950	.277 319
13	20.175 165	73.750 633	.013 559	.049 566	3.655 516	.273 559
14	25.420 707	93.925 798	.010 647	.039 338	3.694 854	.270 647
15	32.030 091	119.346 505	.008 379	.031 221	3.726 074	.268 379
16	40.357 915	151.376 596	.006 606	.024 778	3.750 853	.266 606
17	50.850 973	191.734 511	.005 216	.019 665	3.770 518	.265 216
18	64.072 226	242.585 484	.004 122	.015 607	3.786 125	.264 122
19	80.731 005	306.657 710	.003 261	.012 387	3.798 512	.263 261
20	101.721 066	387.388 715	.002 581	.009 831	3.808 343	.262 581
21	128.168 543	489.109 781	.002 045	.007 802	3.816 145	.262 045
22	161.492 364	617.278 324	.001 620	.006 192	3.822 338	.261 620
23	203.480 379	778.770 688	.001 284	.004 914	3.827 252	.261 284
24	256.385 277	982.251 067	.001 018	.003 900	3.831 152	.261 018
25	323.045 450	1238.636 345	.000 807	.003 096	3.834 248	.260 807
26	407.037 266	1561.681 794	.000 640	.002 457	3.836 705	.260 640
27	512.866 956	1968.719 061	.000 508	.001 950	3.838 655	.260 508
28	646.212 364	2481.586 016	.000 403	.001 547	3.840 202	.260 403
29	814.227 579	3127.798 381	.000 320	.001 228	3.841 430	.260 320
30	1025.926 749	3942.025 959	.000 254	.000 975	3.842 405	.260 254
31	1292.667 704	4967.952 709	.000 201	.000 774	3.843 178	.260 201
32	1628.761 307	6260.620 413	.000 160	.000 614	3.843 792	.260 160
33	2052.239 247	7889.381 721	.000 127	.000 487	3.844 280	.260 127
34	2585.821 452	9941.620 968	.000 101	.000 387	3.844 666	.260 101
35	3258.135 029	12527.442 420	.000 080	.000 307	3.844 973	.260 080
36	4105.250 137	15785.577 449	.000 063	.000 244	3.845 217	.260 063
37	5172.615 172	19890.827 586	.000 050	.000 193	3.845 410	.260 050
38	6517.495 117	25063.442 758	.000 040	.000 153	3.845 564	.260 040
39	8212.043 848	31580.937 875	.000 032	.000 122	3.845 685	.260 032
40	10347.175 248	39792.981 723	.000 025	.000 097	3.845 782	.260 025
	$S^n = (1+i)^n$	$S_{\overline{n}|} = \frac{S^n - 1}{i}$	$1/S_{\overline{n}|} = \frac{i}{S^n - 1}$	$V^n = \frac{1}{S^n}$	$A_{\overline{n}|} = \frac{1 - 1/S^n}{i}$	$\frac{1}{A_{\overline{n}|}} = \frac{i}{1 - 1/S^n}$

YEARS	1 AMOUNT OF ONE	2 AMOUNT OF ONE PER PERIOD	3 SINKING FUND FACTOR	4 PRESENT WORTH OF ONE	5 PRESENT WORTH ONE PER PERIOD	6 PARTIAL PAYMENT
1	1.270 000	1.000 000	1.000 000	.787 402	.787 402	1.270 000
2	1.612 900	2.270 000	.440 529	.620 001	1.407 403	.710 529
3	2.048 383	3.882 900	.257 539	.488 190	1.895 593	.527 539
4	2.601 446	5.931 283	.168 598	.384 402	2.279 994	.438 598
5	3.303 837	8.532 729	.117 196	.302 678	2.582 673	.387 196
6	4.195 873	11.836 566	.084 484	.238 329	2.821 002	.354 484
7	5.328 759	16.032 439	.062 374	.187 661	3.008 663	.332 374
8	6.767 523	21.361 198	.046 814	.147 765	3.156 428	.316 814
9	8.594 755	28.128 721	.035 551	.116 350	3.272 778	.305 551
10	10.915 339	36.723 476	.027 231	.091 614	3.364 392	.297 231
11	13.862 480	47.638 815	.020 991	.072 137	3.436 529	.290 991
12	17.605 350	61.501 295	.016 260	.056 801	3.493 330	.286 260
13	22.358 794	79.106 644	.012 641	.044 725	3.538 055	.282 641
14	28.395 668	101.465 438	.009 856	.035 217	3.573 272	.279 856
15	36.062 499	129.861 106	.007 701	.027 730	3.601 001	.277 701
16	45.799 373	165.923 605	.006 027	.021 834	3.622 836	.276 027
17	58.165 204	211.722 978	.004 723	.017 192	3.640 028	.274 723
18	73.869 809	269.888 182	.003 705	.013 537	3.653 565	.273 705
19	93.814 658	343.757 991	.002 909	.010 659	3.664 225	.272 909
20	119.144 615	437.572 649	.002 285	.008 393	3.672 618	.272 285
21	151.313 661	556.717 264	.001 796	.006 609	3.679 227	.271 796
22	192.168 350	708.030 926	.001 412	.005 204	3.684 430	.271 412
23	244.053 804	900.199 276	.001 111	.004 097	3.688 528	.271 111
24	309.948 332	1144.253 080	.000 874	.003 226	3.691 754	.270 874
25	393.634 381	1454.201 412	.000 688	.002 540	3.694 295	.270 688
26	499.915 664	1847.835 793	.000 541	.002 000	3.696 295	.270 541
27	634.892 893	2347.751 457	.000 426	.001 575	3.697 870	.270 426
28	806.313 974	2982.644 350	.000 335	.001 240	3.699 110	.270 335
29	1024.018 748	3788.958 324	.000 264	.000 977	3.700 087	.270 264
30	1300.503 809	4812.977 072	.000 208	.000 769	3.700 856	.270 208
31	1651.639 838	6113.480 882	.000 164	.000 605	3.701 461	.270 164
32	2097.582 594	7765.120 720	.000 129	.000 477	3.701 938	.270 129
33	2663.929 895	9862.703 314	.000 101	.000 375	3.702 313	.270 101
34	3383.190 966	12526.633 209	.000 080	.000 296	3.702 609	.270 080
35	4296.652 527	15909.824 175	.000 063	.000 233	3.702 842	.270 063
36	5456.748 710	20206.476 702	.000 049	.000 183	3.703 025	.270 049
37	6930.070 861	25663.225 412	.000 039	.000 144	3.703 169	.270 039
38	8801.189 994	32593.296 273	.000 031	.000 114	3.703 283	.270 031
39	11177.511 292	41394.486 267	.000 024	.000 089	3.703 372	.270 024
40	14195.439 341	52571.997 559	.000 019	.000 070	3.703 443	.270 019
	$S^n = (1+i)^n$	$S_{\overline{n}|} = \frac{S^n - 1}{i}$	$1/S_{\overline{n}|} = \frac{i}{S^n - 1}$	$V^n = \frac{1}{S^n}$	$A_{\overline{n}|} = \frac{1 - 1/S^n}{i}$	$\frac{1}{A_{\overline{n}|}} = \frac{i}{1 \quad 1/S^n}$

YEARS	1 AMOUNT OF ONE	2 AMOUNT OF ONE PER PERIOD	3 SINKING FUND FACTOR	4 PRESENT WORTH OF ONE	5 PRESENT WORTH ONE PER PERIOD	6 PARTIAL PAYMENT
1	1.280 000	1.000 000	1.000 000	.781 250	.781 250	1.280 000
2	1.638 400	2.280 000	.438 596	.610 352	1.391 602	.718 596
3	2.097 152	3.918 400	.255 206	.476 837	1.868 439	.535 206
4	2.684 355	6.015 552	.166 236	.372 529	2.240 968	.446 236
5	3.435 974	8.699 907	.114 944	.291 038	2.532 006	.394 944
6	4.398 047	12.135 880	.082 400	.227 374	2.759 380	.362 400
7	5.629 500	16.533 927	.060 482	.177 636	2.937 015	.340 482
8	7.205 759	22.163 426	.045 119	.138 778	3.075 793	.325 119
9	9.223 372	29.369 186	.034 049	.108 420	3.184 214	.314 049
10	11.805 916	38.592 558	.025 912	.084 703	3.268 917	.305 912
11	15.111 573	50.398 474	.019 842	.066 174	3.335 091	.299 842
12	19.342 813	65.510 047	.015 265	.051 699	3.386 790	.295 265
13	24.758 801	84.852 860	.011 785	.040 390	3.427 180	.291 785
14	31.691 265	109.611 661	.009 123	.031 554	3.458 734	.289 123
15	40.564 819	141.302 926	.007 077	.024 652	3.483 386	.287 077
16	51.922 969	181.867 745	.005 499	.019 259	3.502 645	.285 499
17	66.461 400	233.790 714	.004 277	.015 046	3.517 692	.284 277
18	85.070 592	300.252 113	.003 331	.011 755	3.529 447	.283 331
19	108.890 357	385.322 705	.002 595	.009 184	3.538 630	.282 595
20	139.379 657	494.213 062	.002 023	.007 175	3.545 805	.282 023
21	178.405 962	633.592 720	.001 578	.005 605	3.551 410	.281 578
22	228.359 631	811.998 682	.001 232	.004 379	3.555 789	.281 232
23	292.300 327	1040.358 312	.000 961	.003 421	3.559 210	.280 961
24	374.144 419	1332.658 640	.000 750	.002 673	3.561 883	.280 750
25	478.904 857	1706.803 059	.000 586	.002 088	3.563 971	.280 586
26	612.998 216	2185.707 916	.000 458	.001 631	3.565 602	.280 458
27	784.637 717	2798.706 132	.000 357	.001 274	3.566 877	.280 357
28	1004.336 278	3583.343 849	.000 279	.000 996	3.567 873	.280 279
29	1285.550 435	4587.680 126	.000 218	.000 778	3.568 650	.280 218
30	1645.504 557	5873.230 562	.000 170	.000 608	3.569 258	.280 170
31	2106.245 833	7518.735 119	.000 133	.000 475	3.569 733	.280 133
32	2695.994 667	9624.980 953	.000 104	.000 371	3.570 104	.280 104
33	3450.873 173	12320.975 619	.000 081	.000 290	3.570 394	.280 081
34	4417.117 662	15771.848 793	.000 063	.000 226	3.570 620	.280 063
35	5653.910 607	20188.966 455	.000 050	.000 177	3.570 797	.280 050
36	7237.005 577	25842.877 062	.000 039	.000 138	3.570 935	.280 039
37	9263.367 139	33079.882 639	.000 030	.000 108	3.571 043	.280 030
38	11857.109 938	42343.249 778	.000 024	.000 084	3.571 127	.280 024
39	15177.100 721	54200.359 716	.000 018	.000 066	3.571 193	.280 018
40	19426.688 922	69377.460 437	.000 014	.000 051	3.571 245	.280 014
	$S^n = (1+i)^n$	$S_{\overline{n}|} = \frac{S^n - 1}{i}$	$1/S_{\overline{n}|} = \frac{i}{S^n - 1}$	$V^n = \frac{1}{S^n}$	$A_{\overline{n}|} = \frac{1 - 1/S^n}{i}$	$\frac{1}{A_{\overline{n}|}} = \frac{i}{1 \quad 1/S^n}$

YEARS	1 AMOUNT OF ONE	2 AMOUNT OF ONE PER PERIOD	3 SINKING FUND FACTOR	4 PRESENT WORTH OF ONE	5 PRESENT WORTH ONE PER PERIOD	6 PARTIAL PAYMENT
1	1.290 000	1.000 000	1.000 000	.775 194	.775 194	1.290 000
2	1.664 100	2.290 000	.436 681	.600 925	1.376 119	.726 681
3	2.146 689	3.954 100	.252 902	.465 834	1.841 953	.542 902
4	2.769 229	6.100 789	.163 913	.361 111	2.203 064	.453 913
5	3.572 305	8.870 018	.112 739	.279 931	2.482 996	.402 739
6	4.608 274	12.442 323	.080 371	.217 001	2.699 997	.370 371
7	5.944 673	17.050 597	.058 649	.168 218	2.868 214	.348 649
8	7.668 628	22.995 270	.043 487	.130 401	2.998 616	.333 487
9	9.892 530	30.663 898	.032 612	.101 086	3.099 702	.322 612
10	12.761 364	40.556 428	.024 657	.078 362	3.178 064	.314 657
11	16.462 160	53.317 792	.018 755	.060 745	3.238 809	.308 755
12	21.236 186	69.779 952	.014 331	.047 089	3.285 899	.304 331
13	27.394 680	91.016 138	.010 987	.036 503	3.322 402	.300 987
14	35.339 137	118.410 819	.008 445	.028 297	3.350 699	.298 445
15	45.587 487	153.749 956	.006 504	.021 936	3.372 635	.296 504
16	58.807 859	199.337 443	.005 017	.017 005	3.389 640	.295 017
17	75.862 137	258.145 302	.003 874	.013 182	3.402 821	.293 874
18	97.862 157	334.007 439	.002 994	.010 218	3.413 040	.292 994
19	126.242 183	431.869 596	.002 316	.007 921	3.420 961	.292 316
20	162.852 416	558.111 779	.001 792	.006 141	3.427 102	.291 792
21	210.079 617	720.964 195	.001 387	.004 760	3.431 862	.291 387
22	271.002 705	931.043 812	.001 074	.003 690	3.435 552	.291 074
23	349.593 490	1202.046 518	.000 832	.002 860	3.438 412	.290 832
24	450.975 602	1551.640 008	.000 644	.002 217	3.440 630	.290 644
25	581.758 527	2002.615 610	.000 499	.001 719	3.442 349	.290 499
26	750.468 500	2584.374 137	.000 387	.001 333	3.443 681	.290 387
27	968.104 365	3334.842 636	.000 300	.001 033	3.444 714	.290 300
28	1248.854 630	4302.947 001	.000 232	.000 801	3.445 515	.290 232
29	1611.022 473	5551.801 631	.000 180	.000 621	3.446 135	.290 180
30	2078.218 990	7162.824 104	.000 140	.000 481	3.446 617	.290 140
31	2680.902 497	9241.043 095	.000 108	.000 373	3.446 990	.290 108
32	3458.364 222	11921.945 592	.000 084	.000 289	3.447 279	.290 084
33	4461.289 846	15380.309 814	.000 065	.000 224	3.447 503	.290 065
34	5755.063 901	19841.599 660	.000 050	.000 174	3.447 677	.290 050
35	7424.032 433	25596.663 561	.000 039	.000 135	3.447 811	.290 039
36	9577.001 838	33020.695 993	.000 030	.000 104	3.447 916	.290 030
37	12354.332 371	42597.697 831	.000 023	.000 081	3.447 997	.290 023
38	15937.088 759	54952.030 203	.000 018	.000 063	3.448 059	.290 018
39	20558.844 499	70889.118 961	.000 014	.000 049	3.448 108	.290 014
40	26520.909 403	91447.963 460	.000 011	.000 038	3.448 146	.290 011
	$S^n = (1+i)^n$	$S_{\overline{n}|} = \frac{S^n - 1}{i}$	$1/S_{\overline{n}|} = \frac{i}{S^n - 1}$	$V^n = \frac{1}{S^n}$	$A_{\overline{n}|} = \frac{1 - 1/S^n}{i}$	$\frac{1}{A_{\overline{n}|}} = \frac{i}{1 - 1/S^n}$

YEARS	1 AMOUNT OF ONE	2 AMOUNT OF ONE PER PERIOD	3 SINKING FUND FACTOR	4 PRESENT WORTH OF ONE	5 PRESENT WORTH ONE PER PERIOD	6 PARTIAL PAYMENT
1	1.300 000	1.000 000	1.000 000	.769 231	.769 231	1.300 000
2	1.690 000	2.300 000	.434 783	.591 716	1.360 947	.734 783
3	2.197 000	3.990 000	.250 627	.455 166	1.816 113	.550 627
4	2.856 100	6.187 000	.161 629	.350 128	2.166 241	.461 629
5	3.712 930	9.043 100	.110 582	.269 329	2.435 570	.410 582
6	4.826 809	12.756 030	.078 394	.207 176	2.642 746	.378 394
7	6.274 852	17.582 839	.056 874	.159 366	2.802 112	.356 874
8	8.157 307	23.857 691	.041 915	.122 589	2.924 702	.341 915
9	10.604 499	32.014 998	.031 235	.094 300	3.019 001	.331 235
10	13.785 849	42.619 497	.023 463	.072 538	3.091 539	.323 463
11	17.921 604	56.405 346	.017 729	.055 799	3.147 338	.317 729
12	23.298 085	74.326 950	.013 454	.042 922	3.190 260	.313 454
13	30.287 511	97.625 036	.010 243	.033 017	3.223 277	.310 243
14	39.373 764	127.912 546	.007 818	.025 398	3.248 675	.307 818
15	51.185 893	167.286 310	.005 978	.019 537	3.268 211	.305 978
16	66.541 661	218.472 203	.004 577	.015 028	3.283 239	.304 577
17	86.504 159	285.013 864	.003 509	.011 560	3.294 800	.303 509
18	112.455 407	371.518 023	.002 692	.008 892	3.303 692	.302 692
19	146.192 029	483.973 430	.002 066	.006 840	3.310 532	.302 066
20	190.049 638	630.165 459	.001 587	.005 262	3.315 794	.301 587
21	247.064 529	820.215 097	.001 219	.004 048	3.319 842	.301 219
22	321.183 888	1067.279 626	.000 937	.003 113	3.322 955	.300 937
23	417.539 054	1388.463 514	.000 720	.002 395	3.325 350	.300 720
24	542.800 770	1806.002 568	.000 554	.001 842	3.327 192	.300 554
25	705.641 001	2348.803 338	.000 426	.001 417	3.328 609	.300 426
26	917.333 302	3054.444 340	.000 327	.001 090	3.329 700	.300 327
27	1192.533 293	3971.777 642	.000 252	.000 839	3.330 538	.300 252
28	1550.293 280	5164.310 934	.000 194	.000 645	3.331 183	.300 194
29	2015.381 264	6714.604 214	.000 149	.000 496	3.331 679	.300 149
30	2619.995 644	8729.985 479	.000 115	.000 382	3.332 061	.300 115
31	3405.994 337	11349.981 122	.000 088	.000 294	3.332 355	.300 088
32	4427.792 638	14755.975 459	.000 068	.000 226	3.332 581	.300 068
33	5756.130 429	19183.768 097	.000 052	.000 174	3.332 754	.300 052
34	7482.969 558	24939.898 526	.000 040	.000 134	3.332 888	.300 040
35	9727.860 425	32422.868 084	.000 031	.000 103	3.332 991	.300 031
36	12646.218 553	42150.728 509	.000 024	.000 079	3.333 070	.300 024
37	16440.084 119	54796.947 062	.000 018	.000 061	3.333 131	.300 018
38	21372.109 354	71237.031 180	.000 014	.000 047	3.333 177	.300 014
39	27783.742 160	92609.140 534	.000 011	.000 036	3.333 213	.300 011
40	36118.864 808	120392.882 695	.000 008	.000 028	3.333 241	.300 008
	$S^n = (1+i)^n$	$S_{\overline{n}\rceil} = \frac{S^n - 1}{i}$	$1/S_{\overline{n}\rceil} = \frac{i}{S^n - 1}$	$V^n = \frac{1}{S^n}$	$A_{\overline{n}\rceil} = \frac{1 - 1/S^n}{i}$	$\frac{1}{A_{\overline{n}\rceil}} = \frac{i}{1 - 1/S^n}$

Suggested Readings

BOOKS AND MONOGRAPHS

AMERICAN ASSOCIATION OF STATE HIGHWAY OFFICIALS. *Acquisitions for Right of Way*. Washington, D.C., 1962.

Prepared as a training tool for trainees in right-of-way work; 46 chapters, by various authors, presented in three major groups: legal principles, engineering principles, and appraisal principles.

AMERICAN INSTITUTE OF REAL ESTATE APPRAISERS. *The Appraisal Journal Bibliography, 1932–1969*. Chicago, Ill., 1970.

Author, title, and subject listings for articles.

AMERICAN INSTITUTE OF REAL ESTATE APPRAISERS. *Appraisal Terminology and Handbook*. 5th ed. Chicago, Ill., 1967.

Definitions of hundreds of terms relating to real estate, construction, and architecture; also measurement data, signs and symbols, square and cube root tables, etc.

AMERICAN INSTITUTE OF REAL ESTATE APPRAISERS. *Case Studies in Apartment House Valuation*. Rev. ed. Chicago, Ill., 1969.

Twelve case studies with related comments; also correlation of the Institute of Real Estate Management's annual *Apartment Building Income-Expense Analysis* with appraisal practice.

AMERICAN INSTITUTE OF REAL ESTATE APPRAISERS. *Economic Factors and Case Studies in Hotel and Motel Valuation*. 2nd ed. Chicago, Ill., 1968.

Ten case studies and market value analysis, prepared by Harris, Kerr, Forster & Company in cooperation with the Research Division of the Education Committee, AIREA.

AMERICAN INSTITUTE OF REAL ESTATE APPRAISERS. *Guide to the Analysis of Golf Courses and Country Clubs*. Chicago, Ill., 1968.

Background information and operating cost data plus twelve case studies; written by William H. Crouch and his associates at the American Appraisal Company.

AMERICAN INSTITUTE OF REAL ESTATE APPRAISERS. *Managing an Appraisal Office*. Chicago, Ill., 1971.

A monograph, intended to lessen the appraiser's office-management burden, outlines basic planning and business management procedures; includes organization chart for a six-person office, budget flow-chart, etc.

American Institute of Real Estate Appraisers. *Problems in Rural Real Estate Appraisal, with Suggested Solutions.* 2nd ed. Chicago, Ill., 1968.

American Institute of Real Estate Appraisers. *Problems in Urban Real Estate Appraisal, with Suggested Solutions.* 3rd ed. Chicago, Ill., 1963.

American Institute of Real Estate Appraisers. *Real Estate Appraisal Bibliography.* Chicago, Ill., 1964.
Citations to approximately 4,000 items, largely articles in periodicals, published 1945 through 1963; arranged in subject categories.

American Institute of Real Estate Appraisers. *Real Estate Appraisal Practice.* Chicago, Ill., 1958.
Fifty-eight papers, presented at the Silver Anniversary Conference of AIREA, May 1957, devoted to fundamental principles and their application to the appraisal of specific types of property.

American Institute of Real Estate Appraisers. *Selected Readings in Real Estate Appraisal.* Chicago, Ill., 1953.
Collection of approximately 150 outstanding articles published in *The Appraisal Journal* from 1932 through 1952; arranged in broad subject categories.

American Institute of Real Estate Appraisers. *A Student's Appraisal Report on an Apartment House.* Chicago, Ill., 1966.
A study to illustrate as many of the principles and techniques of multi-unit residential appraising as possible within a single report.

American Institute of Real Estate Appraisers. *A Student's Appraisal Report on Single-Family Residence.* Chicago, Ill., 1966.
A narrative appraisal illustrating principles and techniques used in solving a single-family dwelling appraisal problem.

American Institute of Real Estate Appraisers. *Student Outline and Student Reference Manual, Course 1-A.* Chicago, Ill., 1971.
A combined study guide and notebook for use in AIREA Course 1-A.

American Institute of Real Estate Appraisers. *Urban Renewal and Redevelopment; Articles from The Appraisal Journal.* Chicago, Ill., 1963.
Eighteen articles.

American Institute of Real Estate Appraisers. *Wide Divergencies in Right-of-Way Valuations.* Chicago, Ill., 1971.
Report of a research study made for the Highway Research Board of the National Academy of Sciences.

American Institute of Real Estate Appraisers. *Writing Appraisal Reports.* Chicago, Ill., 1971.
A guide to good writing for reports of almost all types; does not treat preparation of appraisal reports specifically.

American Society of Appraisers. *Appraisal and Valuation Manual.* Washington, D.C., 1956–1972. 9 vol.
Each volume a collection of articles by various authors; articles on real property appraisal included with those on personal and intangible property, etc.

Babcock, Frederick M. *The Valuation of Real Estate.* New York, N.Y., McGraw-Hill Book Co., 1932.
Considered a "classic" of appraisal literature.

Babcock, Henry. *Appraisal Principles and Procedures.* Homewood. Ill., Richard D. Irwin, 1968.
A text prepared for use in college and university courses; presents principles and methods applicable to the appraisal of real estate and all types of property.

Bartlett, Charles R. *Assessing and the Appraisal Process,* 4th ed. Chicago, Ill., International Association of Assessing Officers, 1971.
The appraisal of real estate for assessment purposes; written as a text and reference work for the assessor and appraiser.

Bloom, George. *The Appraisal Data Plant.* Doctoral dissertation. Bloomington, Ind., Indiana University, 1953.
Report on examination of specific collections of data, plus in-depth conclusions and recommendations for the improvement of this appraisal tool.

California Real Estate Association. *Appraising Apartment Buildings.* Los Angeles, Calif., 1966.
The cost, income, and market data approaches applied to a 20-unit, three-story apartment building.

Crouse, Earl F. and Everett, Charles H. *Rural Appraisals.* Englewood Cliffs, N.J., Prentice-Hall, Inc., 1956.
Presents procedure known as the American Rural Appraisal System first developed in 1934 by a subcommittee of the National Joint Committee on Rural Credits and revised subsequently.

Ellwood, L. W. *Ellwood Tables for Real Estate Appraising and Financing.* 3rd ed. Chicago, Ill., American Institute of Real Estate Appraisers, 1970. 2 vol.
Mortgage-equity capitalization. Volume 1: explanatory text; Volume 2: tables for professional analysis and appraisal of income property and for sound investment decision-making.

Encyclopedia of Real Estate Appraising, edited by Edith J. Friedman, 2nd ed. Englewood Cliffs, N.J., Prentice-Hall, Inc., 1968.
Various appraisal techniques and approaches plus the appraisal of specific property types covered in 51 monographic chapters by different authors.

Graaskamp, James A. *A Guide to Feasibility Analysis,* Chicago, Ill., Society of Real Estate Appraisers, 1970.
A technical discussion of methodology, with applications.

Institute on Planning, Zoning, and Eminent Domain. *Proceedings.* New York, N.Y., Matthew Bender and Co.
Papers delivered at sessions of the Institute, which is a continuing legal education program of the Southwestern Legal Foundation, Dallas, Texas; series started in 1959.

KAHN, SANDERS A.; CASE, FREDERICK E.; and SCHIMMEL, ALFRED. *Real Estate Appraisal and Investment.* New York, N.Y., Ronald Press, 1963.
A textbook covering all phases of real estate appraising plus special sections on investment analysis of specific property types.

KALTENBACH, HENRY J. *Just Compensation Revised: A Legal Service Concerning the Price To Be Paid for Condemned Land.* Warrenton, Va., Right of Way Consultants, Inc. (looseleaf service)
Systematic report of legal decisions; subject arrangement.

KINNARD, WILLIAM N., JR. *Income Property Valuation; Principles and Techniques of Appraising Income-Producing Real Estate.* Lexington, Mass., Heath, 1971.
Introduces the income capitalization process, assuming reader familiarity with other appraisal principles and techniques.

KINNARD, WILLIAM N., JR. *Industrial Real Estate.* 2nd ed. Washington, D.C., Society of Industrial Realtors, 1971.
Approximately one hundred pages devoted to the appraisal of industrial property.

KNOWLES, JEROME, JR. *Single-Family Residential Appraisal Manual.* Chicago, Ill., American Institute of Real Estate Appraisers, 1967.
Concise guide on principles and practices; includes instructions for writing the appraisal report.

KRATOVIL, ROBERT. *Real Estate Law.* 5th ed. Englewood Cliffs, N.J., Prentice-Hall, Inc., 1969.
A one-volume textbook on all phases of the law of real estate.

MARSTON, ANSON; WINFREY, ROBLEY; and HEMPSTEAD, JEAN C. *Engineering Valuation and Depreciation.* 2nd ed. New York, N.Y., McGraw-Hill Book Co., 1953.
The appraisal of industrial property, real and otherwise; written as a textbook for schools of engineering and business.

MCMICHAEL, STANLEY L. *McMichael's Appraising Manual.* 4th ed. New York, N.Y., Prentice-Hall, Inc., 1951.
Subtitle: *A Real Estate Appraising Handbook for Use in Field Work and Advanced Study Courses;* chapters on appraising for special purposes and on the appraisal of specific property types.

MURRAY, WILLIAM G. *Farm Appraisal and Valuation.* 5th ed. Ames. Iowa, Iowa State University Press, 1969.
All phases of farm real estate valuation including loan appraisals, assessments, inheritance tax appraisals, and condemnations.

NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM. *Reports.* Washington, D.C., National Academy of Sciences Highway Research Board.
A numbered series, each number on a single topic—e.g., Number 56; *Scenic Easements: Legal, Administrative, and Valuation Problems and Procedures.* Number 107: New approaches to compensation for residential takings.

NETHERTON, ROSS D. *Control of Highway Access.* Madison, Wisc., University of Wisconsin Press, 1963.
On the law of limited-access highways; a legal history of the public highway and its effect on interests in property.

Nichols' Law of Eminent Domain, revised by Julius L. Sackman and Patrick J. Rohan, Rev. 3rd ed. Albany, N.Y., Matthew Bender and Co. (looseleaf)
Comprehensive, multi-volume work; national in scope, exhaustive in treatment.

ORGEL, LEWIS. *Valuation under the Law of Eminent Domain.* 2nd ed. Charlottesville, Va., The Michie Co., 1953. 2 vol.
Quoted frequently in *Nichols' Law of Eminent Domain.*

PULVER, H. E. *Construction Estimates and Costs.* 4th ed. New York, N.Y., McGraw-Hill Book Co., 1969.
Methods of estimating and illustrations of the application of these methods.

RATCLIFF, RICHARD U. *Modern Real Estate Valuation: Theory and Application.* Madison, Wis., Democrat Press, 1965.
The theory of market simulation, variant of the market approach, and its application to the valuation of specific property types; presented as departure from traditional thought in appraising.

RATCLIFF, RICHARD U. *Urban Land Economics.* New York, N.Y., McGraw-Hill Book Co., 1949.
Based on the theory that the determination of urban land use is a market process; chapters on rights in land, demand factors with particular attention to housing, building, finance, and specialized markets.

RING, ALFRED A. *Valuation of Real Estate.* 2nd ed. Englewood Cliffs, N.J., Prentice-Hall, Inc., 1970.
Written essentially as a training and teaching guide for candidates who seek membership in one or more of the principal appraisal societies.

ROHAN, PATRICK J. and RESKIN, MELVIN A. *Condemnation Procedures and Techniques; Forms.* Albany, N.Y., Matthew Bender and Co. (looseleaf service)
Presents condemnation in its procedural setting and synthesizes recent developments; also intended as a supplement to *Nichols on Eminent Domain.*

SCHMUTZ, GEORGE L. *The Appraisal Process.* 3rd ed. rev. Manhattan Beach, Calif., 1959.
Considered a "classic" of appraisal literature; author was President of AIREA in 1940.

SCHMUTZ, GEORGE L. *Condemnation Appraisal Handbook,* revised and enlarged by Edwin M. Rams. Englewood Cliffs, N.J., Prentice-Hall, Inc., 1963.
Concepts, relationships, and analysis of the various problems involving compensation in eminent domain cases; includes case studies pertaining to takings for specific purposes.

Searles, Sidney Z., ed. *A Practical Guide to the Legal Appraisal Aspects of Condemnation.* Philadelphia, Pa., Joint Committee on Continuing Legal Education of the American Law Institute and the American Bar Association, 1969.

Based on revised transcript, expanded, of series of lectures presented in 1967, treating many of the principles and rules of eminent domain.

Sutte, Donald T., Jr. *Appraisal of Roadside Advertising Signs.* Chicago, Ill., American Institute of Real Estate Appraisers, 1972.

Prepared because of the increasing demand for appraisals of billboard and roadside signs resulting from implementation of the federal Highway Beautification Act; appendices include Traffic Audit Bureau method of rating signs and typical lease forms and letters of permission.

Weimer, Arthur M.; Hoyt, Homer; and Bloom, George. *Principles of Urban Real Estate.* 6th ed. New York, N.Y., Ronald Press, 1972.

Textbook intended to provide introduction and decision-oriented approach to many facets of real estate activity.

Wendt, Paul F. *Real Estate Appraisal; A Critical Analysis of Theory and Practice.* New York, N.Y., Henry Holt and Co., 1956.

Traces historical development of appraisal theory, reviews the controversy over the nature of value, and presents a step-by-step analysis of the appraisal process.

Wisconsin Colloquim on Appraisal Research. *Papers and Proceedings,* edited by Richard U. Ratcliff. Madison, Wisc., University of Wisconsin Bureau of Business Research and Service. 1963.

Fifteen papers presented at problem-oriented research planning conference, plus editor's condensation of ideas and suggestions generated.

BUILDING COST MANUALS

Boeckh Building Valuation Manual. Milwaukee, Wisc., American Appraisal Co., 1967. 3 vols.

Vol. 1—*Residential and Agricultural;* Vol. 2—*Commercial;* Vol. 3—*Industrial and Institutional.* 1967 cost data base; wide variety of building models; built up from unit-in-place costs converted to cost-per-square-foot of floor or ground area. *Boeckh Building Cost Modifier,* published bimonthly for up-dating with current modifiers.

Building Construction Cost Data. Duxbury, Mass., Robert Snow Means Co. Annually; "average unit prices on a wide variety of building construction items for use in making up engineering estimates." Components arranged according to uniform system adopted by American Institute of Architects, Associated General Contractors, and Construction Specifications Institute.

Dodge Building Cost Calculator & Valuation Guide. New York, N.Y., McGraw-Hill Information Systems Co. (looseleaf service; quarterly supplements)

Building costs arranged by frequently occurring types and sizes of buildings; local cost modifiers and historical local cost index tables included. Formerly *Dow Building Cost Calculator.*

Marshall Valuation Service. Los Angeles, Calif., Marshall and Swift Publication Co. (looseleaf service; monthly supplements)
Cost data for determining replacement costs of buildings and other improvements in the United States and Canada; includes current cost multipliers and local modifiers.

Residential Appraisal Manual. St. Louis, Mo., Roy Wenzlick Research Corp., 1968.
Base costs per square foot of ground area for various types of residential structures. Local cost modifier tables issued semi-annually.

Residential Cost Handbook. Los Angeles, Calif., Marshall and Swift Publication Co. (looseleaf service; quarterly supplements)
Presents square foot method and segregated cost method; local modifiers and cost trend modifiers included.

SOURCES OF OPERATING COSTS AND RATIOS

Only a few published sources are cited below. Attention is directed to the first item listed, the annotated bibliography issued by Robert Morris Associates.

Robert Morris Associates. *Sources of Composite Financial Data—A Bibliography.* 3rd ed. Philadelphia, Pa., 1971.
An annotated list of 98 non-government sources; arranged in manufacturing, wholesaling, retail, and service categories, with subject index to specific businesses; publishers' names and addresses given for each citation.

Accounting Corporation of America. *Barometer of Small Business.* San Diego, Calif.
Semi-annually in yearbook and midyear editions; operating figures and statistical ratios for 48 retail and service business types.

Building Owners and Managers Association International. *Office Building Experience Exchange Report.* Chicago, Ill.
Annually, since 1920; analysis of expenses and income (quoted in cents per square foot) ; national, regional, and selected city averages.

Dun & Bradstreet, Inc. *Key Business Ratios in 125 Lines.* New York, N.Y.
Annually, balance sheet, profit-and-loss ratios.

Harris, Kerr, Forster & Co. *Trends in the Hotel-Motel Business.* New York, N.Y.
Annually, since 1937; income-expense data and operating ratios for transient and resort hotels and motels; the geographical data given are by five U.S. regions.

INSTITUTE OF REAL ESTATE MANAGEMENT. *Apartment Building Income-Expense Analysis.* Chicago, Ill.

Annually, since 1954; data arranged by type of building, then by national, regional, metropolitan, and selected city groupings; operating costs per room, per square foot, etc. Formerly *Apartment Building Experience Exchange.*

LAVENTHOL KREKSTEIN HORWATH & HORWATH. *Lodging Industry.* New York, N.Y.

Annually, since 1932; income, expense, and profit data for transient and motor hotels; includes historical trend tables.

LAVENTHOL KREKSTEIN HORWATH & HORWATH. *Restaurant, Country Club, City Club Operations.* New York, N.Y.

Annually; prior to 1970 published in company periodical; operating ratios and financial data.

NATIONAL INSTITUTE OF REAL ESTATE BROKERS. *Percentage Leases.* 13th ed. Chicago, Ill., 1973.

Based on reports of 3,100 leases for 97 retail and service categories in 7 U.S. regions. Data broken down by type of operation, and of area; type of center, and of building; with regional and store averages given for average minimum rent, rent per square foot, average gross leasable area, and sales per square foot.

NATIONAL RETAIL MERCHANTS ASSOCIATION, CONTROLLERS' CONGRESS. *Department Store and Specialty Store Merchandising and Operating Results.* New York, N.Y.

Annually, since 1925; merchandise classification base used since 1969 edition (1968 data); geographical analysis by Federal Reserve Districts. Known as the "MOR" report.

NATIONAL RETAIL MERCHANTS ASSOCIATION, CONTROLLERS' CONGRESS. *Financial and Operating Results of Department and Specialty Stores.* New York, N.Y.

Annually, since 1963; data arranged by sales volume category. Known as the "FOR" Report.

URBAN LAND INSTITUTE. *Dollars and Cents of Shopping Centers.* Washington, D.C., 1972.

First issued in 1961; revised every three years; income and expense data for neighborhood, community, and regional centers; statistics for specific tenant types given.

PERIODICALS

American Right of Way Proceedings. American Right of Way Association, Los Angeles, Calif.

Annually. Publishes papers presented at National Seminars.

Appraisal Digest. New York State Society of Real Estate Appraisers, a Division of the New York State Association of Real Estate Boards, Inc., Albany, N.Y.

Quarterly. Contents primarily articles published elsewhere; some original material included.

Appraisal Institute Magazine. Appraisal Institute of Canada, Winnipeg, Manitoba, Canada.
Quarterly. General and technical articles on appraisal and expropriation in Canada; includes information on Institute programs, news, etc.

The Appraisal Journal. American Institute of Real Estate Appraisers, Chicago, Ill.
Quarterly. The oldest periodical in the appraisal field, published since 1932; technical articles on all phases of real property appraisal; section on legal decisions included as regular feature. Consolidated index covering 1932–1969 available.

Editor and Publisher Market Guide. Editor and Publisher, New York, N.Y.
Annually. Standardized market data for more than 1,500 areas in the United States and Canada; information includes population estimates for trading areas. List of principal industries, transportation, climate, chain store outlets, etc.

Journal of the American Society of Farm Managers and Rural Appraisers. Denver, Colo.
Semi-annually. Appraisal articles included.

Land Economics. University of Wisconsin, Madison, Wisc.
Quarterly. Subtitle: *A Quarterly Journal Devoted to the Study of Economics and Social Institutions.* Good source of reports on university research; covers trends in land utilization; frequent articles on developments in other countries.

The Real Estate Appraiser. Society of Real Estate Appraisers, Chicago, Ill.
Bimonthly. Technical articles and Society news; section on legal cases included as regular feature. Consolidated bibliographies for 1935–1960 and 1961–1970 available. Previously published as *The Review* and as *Residential Appraiser.*

Right of Way. American Right of Way Association, Los Angeles, Calif.
Bimonthly. Articles on all phases of right of way activity; condemnation, negotiation, etc.; pipelines, electric power transmission lines, and other uses as well as highways; includes Association news.

Small Business Reporter. Bank of America, San Francisco, Calif.
Irregularly. Each issue devoted to a specific type of small business; has covered, for instance, coin-operated laundries, greeting card shops, and restaurants.

Survey of Buying Power. Sales Management, New York, N.Y.
Annually. Population totals and characteristics, income and consumption data presented in various categories: national, regional, metropolitan area, county, city; separate section of Canadian information. A source for population estimates between the decennial United States censuses.

Valuation. American Society of Appraisers, Washington, D.C.
Three issues per year. Articles on real property valuation included with articles on the appraisal of personal and intangible property; includes Society news. Previously published as *Technical Valuation.*

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